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THE AMERICAN MUSEUM JOURNAL

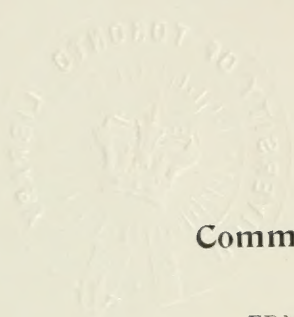


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CONTENTS OF VOLUME II.

	PAGE
TITLE-PAGE	i
COMMITTEE OF PUBLICATION	ii
TRUSTEES, OFFICERS AND COMMITTEES	iii
SCIENTIFIC STAFF	iv
CONTENTS	v
LIST OF ILLUSTRATIONS	ix

NO. 1, JANUARY, 1902.

EDITORIAL	1
GEOLOGICAL DEPARTMENT	1
ANTHROPOLOGICAL WORK IN THE SOUTHWEST	3
NEW BIRD GROUPS	4
NOTES AND NEWS	4
LECTURE ANNOUNCEMENTS	7
THE HALL OF FOSSIL VERTEBRATES. By W. D. MATTHEW.	

Supplement

NO. 2, FEBRUARY, 1902.

EDITORIAL	II
A REMARKABLE SLAB OF FOSSIL CRINOIDS. By E. O. HOVEY.	
(Illustrated)	II
DEPARTMENT OF PUBLIC INSTRUCTION	14
THE ANDREW J. STONE EXPEDITION	16
NEWS NOTES	17
LECTURE ANNOUNCEMENTS	20
THE COLLECTION OF MINERALS. By L. P. GRATACAP.	

Supplement

NO. 3, MARCH, 1902.

ANNUAL MEETING OF THE BOARD OF TRUSTEES	23
A FOSSIL ARMADILLO FROM TEXAS. By J. W. GIDLEY (Illustrated)	24
INTERNATIONAL CONGRESS OF AMERICANISTS	25
NEWS NOTE	28
<i>HYPOCEPHALUS ARMATUS</i> . By WM. BEUTENMÜLLER (Illustrated)	29
LECTURE ANNOUNCEMENTS	30
NORTH AMERICAN RUMINANTS. By J. A. ALLEN.	

Supplement

CONTENTS

NO. 4, APRIL, 1902.

	PAGE
EDITORIAL	31
DEPARTMENT OF PUBLIC INSTRUCTION	31
ILLUSTRATIONS OF TERMS IN DESCRIPTIVE ORNITHOLOGY. By	
F. M. CHAPMAN (Illustrated)	33
MEXICAN CODICES. By F. W. PUTNAM	34
NEWS NOTES	36
LECTURE ANNOUNCEMENTS	38
THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH. By	
GEORGE H. PEPPER	Supplement

NO. 5, MAY, 1902.

EDITORIAL	39
A HERMAPHRODITE IO MOTH	39
NEWS NOTES:	
DEPARTMENT OF VERTEBRATE PALEONTOLOGY	40
DEPARTMENT OF MAMMALOGY AND ORNITHOLOGY	41
DEPARTMENT OF ANTHROPOLOGY	43
RECENT PUBLICATIONS	45
ATTENDANCE AT THE MUSEUM DURING 1901	46
THE BUTTERFLIES OF THE VICINITY OF NEW YORK CITY. By	
WILLIAM BEUTENMÜLLER	Supplement

NO. 6, JUNE, 1902.

NEW ETHNIC GROUPS	47
THE DEVELOPMENT OF THE AMERICAN MUSEUM OF NATURAL HISTORY (<i>Continued</i>). DEPARTMENT OF ANTHROPOLOGY. By FRANZ BOAS	47
DEPARTMENT OF VERTEBRATE PALEONTOLOGY. SUMMER PLANS.	53

NO. 7, OCTOBER, 1902.

EDITORIAL	55
A VISIT TO MARTINIQUE AND ST. VINCENT AFTER THE GREAT ERUPTIONS OF MAY AND JUNE, 1902. By E. O. HOVEY.	57
RECENT ETHNOLOGICAL WORK OF THE MUSEUM.	63
ETHNOLOGICAL WORK IN THE SOUTHWESTERN UNITED STATES AND MEXICO	68
AUTUMN COURSE OF LECTURES TO TEACHERS	72
NEWS NOTES	72

CONTENTS

NO. 8, NOVEMBER, 1902.

	PAGE
EDITORIAL	77
ENTOMOLOGICAL WORK IN THE BLACK MOUNTAINS OF NORTH CAROLINA. By WM. BEUTENMÜLLER (Illustrated) . . .	77
COLLECTING FLAMINGOES AND THEIR NESTS IN THE BAHAMA ISLANDS. By FRANK M. CHAPMAN (Illustrated) . . .	79
LECTURE ANNOUNCEMENTS	83
NOTES	85
THE SEQUOIA. A HISTORICAL REVIEW OF BIOLOGICAL SCIENCE. By GEORGE H. SHERWOOD	Supplement

NO. 9, DECEMBER, 1902.

THE THIRTEENTH INTERNATIONAL CONGRESS OF AMERICANISTS.	87
NEWS NOTES	93
LECTURES	96
MEETINGS OF SCIENTIFIC SOCIETIES	97



LIST OF ILLUSTRATIONS.

THE JOURNAL.

	PAGE
<i>UINTACRINUS SOCIALIS</i> —GRINNELL. FOSSIL CRINOID FROM KANSAS	10
<i>UINTACRINUS SOCIALIS</i> —GRINNELL. AN INDIVIDUAL FROM THE SLAB. NATURAL SIZE	12
A FOSSIL ARMADILLO FROM TEXAS	22
<i>HYPOCEPHALUS ARMATUS</i> DESMAREST	29
TYPES OF BILLS. TYPES OF FEET. TWO PARTS OF THE EXHIBIT DESIGNED TO ILLUSTRATE TERMS USED IN DESCRIPTIVE ORNITHOLOGY	32
THE IO MOTH	39
THE RED-EYED VIREO	42
LA SOUFRIÈRE, ST. VINCENT	56
MT. PELÉE AND THE RUINS OF ST. PIERRE, MARTINIQUE	58
"BREAD-CRUST" VOLCANIC BOMB FROM MT. PELÉE	60
MAP SHOWING THE ROUTES FOLLOWED BY DR. HRDLÍČKA IN HIS INVESTIGATIONS AMONG THE INDIANS OF THE SOUTHWESTERN UNITED STATES AND MEXICO	69
THE BLACK BROTHERS, NORTH CAROLINA	76
FLAMINGO NESTS. PART OF COLONY OCCUPIED IN 1900	78

SUPPLEMENTS.

TO NO. I.

THE HALL OF FOSSIL VERTEBRATES.

THE HALL OF FOSSIL VERTEBRATES	2
"AGE OF REPTILES"	6
"AGE OF MAMMALS"	7
RESTORATION OF TITANOTHERIUM, AN EXTINCT HOOFED MAMMAL OF WESTERN AMERICA	8
EVOLUTION OF THE HORSE. SKULL, FOREFOOT AND HIND FOOT	9
EVOLUTION OF THE HORSE—FEET	10
HALL OF FOSSIL VERTEBRATES. PLAN OF PRESENT ARRANGEMENT OF CASES, JANUARY, 1902	12

ILLUSTRATIONS

	PAGE
SKELETON OF BRONTOSAURUS. RESTORATION OF THE SKELETON OF A DINOSAUR, OR GIANT REPTILE	14
PHOTOGRAPH OF THE SKELETON OF THE GREAT MARINE LIZARD IN THE AMERICAN MUSEUM	15
RESTORATION OF THE FOUR-TOED HORSE	17
SCENE IN THE BAD LANDS OF THE UINTA BASIN—TERTIARY FOSSIL FIELD OF NORTHEASTERN UTAH	18

To No. 2.

THE COLLECTION OF MINERALS.

THE MAIN HALL, DEPARTMENT OF MINERALOGY	2
SULPHUR FROM CIANCIANI, ITALY	6
PLAN OF HALLS, DEPARTMENT OF MINERALOGY	8
STIBNITE FROM MT. KOSANG, JAPAN	11
FLUORITE COATED WITH QUARTZ, CUMBERLAND, ENGLAND	12
QUARTZ FROM MAGNET COVE, ARKANSAS	13
AZURITE FROM BISBEE, ARIZONA	15
CALCITE PSEUDOMORPH AFTER ARAGONITE, CIANCIANI, ITALY	16
ARAGONITE ("FLOS-FERRI") FROM STEIERMARK, AUSTRIA	17
MALACHITE FROM BISBEE, ARIZONA	18
RHODONITE FROM FRANKLIN, NEW JERSEY	19
BARITE FROM CUMBERLAND, ENGLAND	20
BARITE FROM CUMBERLAND, ENGLAND	21

To No. 3.

NORTH AMERICAN RUMINANTS.

ELK OR WAPITI. NEW YORK ZOÖLOGICAL PARK	2
PRONGHORN OR AMERICAN ANTELOPE, NEW YORK ZOÖLOGICAL PARK	6
ELK OR WAPITI, NORTH DAKOTA	8
ARIZONA ELK	9
ALASKA MOOSE (<i>Alces gigas</i>)	11
NEWFOUNDLAND CARIBOU (<i>Rangifer terrænovæ</i>)	12
KENAI CARIBOU (<i>Rangifer stonei</i>)	13
VIRGINIA DEER	16
MEXICAN DEER. NEW YORK ZOÖLOGICAL PARK	17

ILLUSTRATIONS

	PAGE
AMERICAN BISON	19
AMERICAN BISON	20
STONE MOUNTAIN-SHEEP (<i>Ovis stonoi</i>)	21
1. STONE MOUNTAIN-SHEEP. 2. ROCKY MOUNTAIN BIGHORN	22
BARREN (GROUND MUSK-OX. ADULT MALE	24
PEARY MUSK-OX. ADULT MALE	26
PEARY MUSK-OX. ADULT FEMALE	28

To No. 4.

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH.

BASKETS AND OTHER OBJECTS FROM THE CAVES OF SOUTHEAST- ERN UTAH. HYDE EXPEDITION	2
BURIAL CAVE OF BASKET MAKERS, GRAND GULCH, UTAH	4
BASKET BURIAL, GRAND GULCH, UTAH	5
BASKET BURIAL, GRAND GULCH, UTAH	6
BURDEN AND OTHER TYPES OF BASKETS	8
FOOD TRAYS OR MEAL BOWLS	10
FOOD TRAY WITH BUTTERFLY DESIGN	12
FOOD TRAY WITH WATER-FOWL DESIGN	13
FOOD TRAY WITH BUTTERFLY AND WATER-FOWL DESIGNS	15
OPEN-WORK, OR "SIFTER," BASKET	17
BOWL-SHAPED BASKET WITH SUN-AND-MOUNTAIN DESIGN	19
BOWL-SHAPED BASKET WITH MOUNTAIN DESIGN	19
FOOD OR GAMBLING TRAY	21
YUCCA SPLINT BASKET	23
FOOD BASKET OF COILED WORK	23
SMALL STORAGE BASKETS	23
YUCCA BASKET AS FOUND IN A CAVE, GRAND GULCH, UTAH	25

To No. 5.

THE BUTTERFLIES OF THE VICINITY OF NEW YORK CITY.

TIGER SWALLOWTAIL (<i>Papilio turnus</i>)	3
BLACK SWALLOWTAIL (<i>Papilio asterias</i>)	4
GREEN CLOUDED SWALLOWTAIL (<i>Papilio troilus</i>)	5
GIANT SWALLOWTAIL (<i>Papilio cresphontes</i>)	6
ZEBRA SWALLOWTAIL (<i>Papilio ajax</i>)	7
BLUE SWALLOWTAIL (<i>Papilio philenor</i>)	8

ILLUSTRATIONS

	PAGE
IMPORTED CABBAGE BUTTERFLY (<i>Pieris rapæ</i>)	10
SOUTHERN CABBAGE BUTTERFLY (<i>Pieris protodice</i>)	10
DOG'S-HEAD BUTTERFLY (<i>Colias cæsonia</i>)	11
CLOUDED SULPHUR BUTTERFLY (<i>Colias philodice</i>)	11
ORANGE-TIP (<i>Euchloë genutia</i>)	12
ORANGE BUTTERFLY (<i>Eurema nicippi</i>)	12
LITTLE SULPHUR BUTTERFLY (<i>Eurema lisa</i>)	13
CLOUDLESS SULPHUR BUTTERFLY (<i>Catopsilia eubule</i>)	13
MILKWEED OR MONARCH BUTTERFLY (<i>Anosia plexippus</i>)	14
REGAL FRITILLARY (<i>Argynnis idalia</i>)	17
GREAT SPANGLED FRITILLARY (<i>Argynnis cybele</i>)	17
SILVER-BORDERED FRITILLARY (<i>Argynnis myrina</i>)	18
MEADOW FRITILLARY (<i>Argynnis bellona</i>)	18
VARIEGATED FRITILLARY (<i>Euptoietia claudia</i>)	19
PEARL CRESCENT (<i>Phyciodes tharos</i>)	19
SILVER CRESCENT (<i>Phyciodes nycteis</i>)	19
BLACK CHECKER BUTTERFLY (<i>Melitæa phaëton</i>)	20
HARRIS'S BUTTERFLY (<i>Melitæa harrisii</i>)	20
VIOLET-TIP (<i>Polygonia interrogationis</i>)	21
HOP MERCHANT OR COMMA BUTTERFLY (<i>Polygonia comma</i>)	21
MARBLED COMMA BUTTERFLY (<i>Polygonia faunus</i>)	22
GRAY COMMA BUTTERFLY (<i>Polygonia progne</i>)	23
WHITE-J BUTTERFLY (<i>Polygonia j-album</i>)	23
AMERICAN TORTOISE-SHELL BUTTERFLY (<i>Vanessa milberti</i>)	24
MOURNING-CLOAK BUTTERFLY (<i>Vanessa antiopa</i>)	24
THISTLE BUTTERFLY (<i>Pyrameis cardui</i>)	25
PAINTED BEAUTY OR HUNTER'S BUTTERFLY (<i>Pyrameis hunteri</i>)	25
RED ADMIRAL (<i>Pyrameis atalanta</i>)	26
BUCKEYE BUTTERFLY (<i>Junonia cænia</i>)	26
BLUE VICEROY (<i>Limenitis astyanax</i>)	27
BROWN VICEROY (<i>Limenitis disippus</i>)	27
BLUE-EYED GRAYLING (<i>Satyrus alope</i>)	29
PEARLY-EYED GRAYLING (<i>Debis portlandia</i>)	29
EYED GRAYLING (<i>Neonympha canthus</i>)	30
LITTLE WOOD-SATYR (<i>Neonympha eurytus</i>)	30
SNOUT BUTTERFLY (<i>Libythea bachmani</i>)	31
GRAY HAIR-STREAK (<i>Thecla melinus</i>)	33
BANDED HAIR-STREAK (<i>Thecla calanus</i>)	33
STRIPED HAIR-STREAK (<i>Thecla strigosa</i>)	33
HOARY HAIR-STREAK (<i>Thecla irus</i>)	34

ILLUSTRATIONS

	PAGE
CORAL HAIR-STREAK (<i>Thecla titus</i>)	34
GREEN HAIR-STREAK (<i>Thecla damon</i>)	35
BROWN ELFIN (<i>Thecla augustus</i>)	35
PINE HAIR-STREAK (<i>Thecla nippon</i>)	35
TAILED BLUE BUTTERFLY (<i>Lycæna comyntas</i>)	36
SCUDDER'S BLUE BUTTERFLY (<i>Lycæna scudderii</i>)	36
SPRING AZURE BUTTERFLY (<i>Lycæna pseudargiolus</i>)	36
AMERICAN COPPER BUTTERFLY (<i>Chrysophanus hypophlæas</i>)	37
BRONZE COPPER BUTTERFLY (<i>Chrysophanus thoë</i>)	37
THE WANDERER (<i>Feniseca tarquinius</i>)	37
SMALL SKIPPER (<i>Ancyloxypha numitor</i>)	41
MASSASOIT SKIPPER (<i>Pamphila massasoit</i>)	41
LOGAN SKIPPER (<i>Pamphila logan</i>)	41
HOBOMOK SKIPPER (<i>Pamphila hobomok</i>)	42
LEONARD'S SKIPPER (<i>Pamphila leonardus</i>)	42
HURON SKIPPER (<i>Pamphila huron</i>)	42
SASSACUS SKIPPER (<i>Pamphila sassacus</i>)	43
MYSTIC SKIPPER (<i>Pamphila mystic</i>)	43
COMMON SKIPPER (<i>Pamphila cernes</i>)	43
EGEREMET SKIPPER (<i>Pamphila otho</i> , VAR. <i>egeremet</i>)	44
METACOMET SKIPPER (<i>Pamphila metacomet</i>)	44
HIANNA SKIPPER (<i>Pamphila hianna</i>)	44
PECK'S SKIPPER (<i>Pamphila peckius</i>)	45
PONTIAC SKIPPER (<i>Pamphila pontiac</i>)	45
OCOLA SKIPPER (<i>Pamphila ocola</i>)	45
SPOTTED SKIPPER (<i>Pamphila phylæus</i>)	46
CLOUDED SKIPPER (<i>Pamphila accius</i>)	46
GLASS-SPOTTED SKIPPER (<i>Pamphila verna</i>)	46
MANATAAQUA SKIPPER (<i>Pamphila manataaqua</i>)	46
BROAD-WINGED SKIPPER (<i>Pamphila viator</i>)	47
CHECKERED HESPERID (<i>Pyrgus tesellatus</i>)	47
GRIZZLED HESPERID (<i>Pyrgus centaureæ</i>)	47
SOOTY SKIPPER (<i>Pholisora catullus</i>)	48
<i>Nisoniades brizo</i>	48
<i>Nisoniades icelus</i>	49
<i>Nisoniades persius</i>	49
<i>Nisoniades martialis</i>	49
<i>Nisoniades juvenalis</i>	50
GOLDEN-BANDED HESPERID (<i>Eudamus cellus</i>)	50
NORTHERN CLOUDY-WING (<i>Eudamus pylades</i>)	50

ILLUSTRATIONS

	PAGE
SOUTHERN CLOUDY-WING (<i>Eudamus bathyllus</i>) . . .	51
SILVER-SPOTTED HESPERID (<i>Eudamus tityrus</i>) . . .	51
HOARY CLOUDY-WING (<i>Eudamus lycidas</i>) . . .	52
LONG-TAILED HESPERID (<i>Eudamus proteus</i>) . . .	52

To No. 8.

THE SEQUOIA. A HISTORICAL REVIEW OF BIOLOGICAL SCIENCE.

THE FALL OF "MARK TWAIN"	2
MAP SHOWING DISTRIBUTION OF THE "BIG TREE"	5
DIAGRAM OF THE STRUCTURE OF THE STEM OF AN EXOGENOUS TREE OF THREE YEARS' GROWTH	7
THE SECTION OF THE "BIG TREE" IN THE MUSEUM	9
FELLING THE TREE	16
THE SECTION BEFORE SHIPMENT	22
THE STUMP OF "MARK TWAIN"	26



The American Museum Journal

VOL. II.

JANUARY, 1902

NO. 1.



THE present number of the JOURNAL, commencing Volume II, inaugurates certain changes in typography and page which it is hoped will prove acceptable to our readers and to those who make use of the supplements. The plan which was adopted with the number for October last of issuing a supplementary guide leaflet to an exhibit or group of exhibits in the Museum has met with so much favor that it will be continued for the present. The supplement issued with the current number is a general description of the material on exhibition in and of the arrangement of the hall of Vertebrate Palæontology. It is proposed to prepare several similar illustrated leaflets describing at some length and in a popular manner different portions of the exhibit in this hall which may be considered as units. The authorities of the Museum are issuing the JOURNAL as a means of bringing the institution into close touch with the public and the schools, and it is to be hoped that the friends of the Museum will assist in making the circulation of the publication as large as possible. The JOURNAL proper will continue to give to the public items of news regarding the work of the various departments, notable new accessions, programs of lectures and popular short articles on specimens in the Museum. The price of subscription to those not members of the institution has been placed at the low price of one dollar per year, which barely covers the actual cost of paper, illustrations, printing and postage.

The Department of Geology has just completed a large undertaking, namely, the publication of a tabulated catalogue of all the type and figured specimens contained in its extensive collection of fossils. The term "type", as employed in this Department of the Museum, embraces not only the specimens actually

THE AMERICAN MUSEUM JOURNAL

used by an author in the original description of a species, but also those specimens which have been used by the same author in the further elucidation of the species in subsequent publications. The types may or may not have been illustrated in connection with the first publication. "Figured specimen" is the term applied here to the specimens which have been identified with a species by another person than the author of the species and which have been illustrated in some publication. From the standpoint of the student and investigator, such specimens are the most valuable portion of any collection, and should, therefore, be marked in some conspicuous manner and be preserved with the greatest care, while the knowledge of their location and their history should be as widely disseminated as possible. All the types and figured specimens in this Department are individualized by the use of a small rhomb of emerald green paper securely gummed to each.

There are in this Department of the Museum 8,345 type and figured specimens, representing 2,721 species and 190 varieties, distributed in the Catalogue according to the following table:

PARTS.	TYPES.			FIG'D SPECIMENS.			REFERENCES.	
	Species.	Varieties.	Specimens.	Species.	Varieties.	Specimens.	Page.	Figure.
I.....	448	10	1070	16	107	450	836	2372
II.....	635	22	1791	92	0	625	1236	4504
III.....	667	27	1707	158	5	717	3329	5437
IV.....	472	12	1598	233	7	387	1160	2011
Totals.....	2222	71	6166	499	119	2179	6561	14324

Part I, issued in July, 1898, embraces the specimens in the Cambrian and Lower Silurian systems; Part II, issued in October, 1899, includes the material from the Upper Silurian system;

THE AMERICAN MUSEUM JOURNAL

Part III, issued in October, 1900, comprises that from the Devonian system; and Part IV, bearing date of December 27, 1901, lists the remainder of the collection from Lower Carboniferous to Quaternary, inclusive, and contains the preface, table of contents and index to the whole work.

ANTHROPOLOGICAL WORK AMONG THE INDIAN TRIBES OF THE SOUTHWEST.



IN January 1 Dr. Aleš Hrdlička, of the Department of Anthropology, started on his fourth expedition for this Museum to the region of the Aztecs, Pueblos and Cliff-Dwellers, and he expects to return in about eight months.

These expeditions have had for their object the systematic study of the physical characteristics of all the Aztec, Pueblo and Cliff-Dweller tribes, living or extinct, from southern Utah and southern Colorado down to the state of Morelos, Mexico. Among other results which may be expected are the definite identification of these tribes and either a refutation or a confirmation of the theory that the Aztecs came from the north and were probably related to the Pueblos. Physiological observations are also made for a comparison of some of the principal functions of the body, such as pulse, temperature, respiration and muscular force, in these tribes and in white men. Medical observations are made on the ordinary diseases among the Indians and on their manner of treating them.

Dr. Hrdlička's previous expeditions in this series have been as follows: first, in Mexico, in 1898, with Dr. Carl Lumholtz, covering the Tarahumares, Huichols and Tepecanos; second, in 1899, to the Navahos and southern Utes; third, in 1900, to all the Pueblos and Apaches. The present expedition will cover the remaining tribes in southwestern Arizona and northern Mexico, among them the Bimas, Papagos, Yaquis, Mayos, Tepehuanes, Coras, Aztecs and Tarascos. The first expedition was supported by the Museum; the second, third and fourth by Mr. Frederick E. Hyde, Jr.

THE AMERICAN MUSEUM JOURNAL

NEW BIRD GROUPS.



THROUGH the generosity of a friend of the Museum, who desires to have his name withheld from the public, six groups have recently been added to the very attractive and instructive series representing birds amid their natural surroundings which are to be seen in the halls of the Ornithological Department. The new groups represent the American dipper, or water-ousel, the osprey, the yellow-headed blackbird, the coot, Wilson's phalarope and the wild pigeon. The material for the first-named was gathered by Mr. Frank M. Chapman last summer on the banks of a rushing icy stream issuing from a glacier in the Selkirk mountains of British Columbia. The rocky bank of the stream, the nest in the cleft of the rock and the birds in and about the nest have been reproduced with lifelike fidelity in the Museum exhibition case. Mr. Chapman collected the specimens and accessories for the osprey group on Gardiner's Island, off the eastern end of Long Island, and those for the blackbird, coot and phalarope groups at Shoal Lake, Manitoba. The twelve specimens included in the wild-pigeon group were secured with much difficulty from collectors and dealers throughout the country, the surprising fact being incidentally developed that a species which, within the last fifty years, was one of the most abundant native birds of this country, is now so rare, not only in nature, but also in collections, that specimens of it are practically unobtainable. Each of these new groups is designed to illustrate not only the haunts and habits of a species of birds, but also some fact of general biological interest. This feature will be fully set forth in the labels accompanying the cases.

NOTES AND NEWS.

DEPARTMENT OF ENTOMOLOGY.—Mr. William Beutenmüller, the Curator of this Department of the Museum, again visited the Black mountains of western North Carolina during September and October last for the purpose of securing specimens of the insects occurring in this interesting region and of obtaining

THE AMERICAN MUSEUM JOURNAL

scientific data regarding their surroundings and life-histories. The results of the expedition are highly satisfactory and demonstrate the desirability of carrying the work on to completion. About 3500 specimens were collected on this trip, supplementing the 3000 which were obtained in the same region last year. The insect fauna of the mountainous region of western North Carolina is very distinct from that of the surrounding country, and many of the species show northern affinities. Mr. Beutenmüller obtained on this trip many new as well as many very rare species, and he has in preparation a monograph on "The Insect Fauna of the Black Mountains, North Carolina," which it is to be hoped he will be enabled to bring to satisfactory completion by material to be obtained on future expeditions. The Black mountains are a transverse chain forming the principal link of connection between the Blue Ridge and the Smoky mountains, and rise in a region which is very interesting from a geographical and geological as well as from a faunal standpoint. It is the culminating portion of the Appalachian system, the united chains containing, in the district under consideration, twenty-five great peaks, twenty of which are more than 6000 feet in elevation above the sea. Most of these mountains are practically unexplored territory, which furnishes an additional argument for the speedy completion of this entomological survey of it.

THE Department of Anthropology has received the first installment of Chinese clothing, baskets and tools used by the tailor and artificers in allied trades, collected by Dr. Berthold Laufer on his expedition to China, recently undertaken through the generosity of a friend of the Museum. The most striking feature of the consignment just received is the clothing, which represents completely the costumes of various classes of the people and includes a number of magnificently embroidered garments. A portion of this Chinese collection is on exhibition in hall No. 106, on the ground-floor of the building.

IN the same hall (No. 106) will be found the famous Briggs collection, representing the basketry of the Indians of the Pacific coast of the United States, which has been recently received as a

THE AMERICAN MUSEUM JOURNAL

donation from George F. Peabody, Esq. This collection is particularly good in the line of feathered baskets from central California and other kinds from the southern part of that State.

THE Museum has received from Mr. W. Jochelson, of the Jesup North Pacific Expedition, his whole Koryak collection from Siberia, consisting of about 1200 pieces of all sorts, among which there are a great many objects of prehistoric age. This material and that sent in by Mr. W. Bogoras, of the same expedition, which was noticed in the last number of the JOURNAL, have been removed from the original boxes in which they were received and have been placed in storage cases for lack of room in the exhibition halls for displaying them.

ARTHUR CURTISS JAMES, Esq., has purchased the valuable collection of Ainu objects made by Professor Bashford Dean last year and has presented it to the Museum. This latest addition supplements in a very satisfactory manner the two Ainu collections previously owned by the Museum and renders the whole series a very complete representation of the culture of that peculiar people. One of the older Ainu collections was presented by Mr. James, while the other was obtained by Dr. Laufer in 1899, when at work for the Jesup North Pacific Expedition.

MR. MARSHALL H. SAVILLE, Curator of the Section of Mexican Archæology of the Anthropological Department, left New York on December 11 to continue the explorations at the ancient ruined city of Mitla, in the State of Oaxaca, Mexico, which he has been prosecuting with great success for some years with the aid of funds provided by the Duke of Loubat.

THERE has just been erected in the opening of the west stairway an immense totem pole from Queen Charlotte's Island, British Columbia. This fine pole, which is nearly fifty feet tall, stood for many years near the Indian village of Gumshewa on the east coast of the island and was brought to the Museum in 1901 as a result of the Jesup North Pacific expedition.

AN index to Volume I of the JOURNAL is in course of preparation and will be issued as soon as practicable.

THE AMERICAN MUSEUM JOURNAL

LECTURES.

PROFESSOR ALBERT S. BICKMORE, Curator of the Department of Public Instruction, announces the following courses of lectures for the remainder of the season of 1901-1902.

To Teachers in the Public Schools, Saturday mornings at 10:30 o'clock:

January 25th and February 1st.—“Naples, Pompeii and Rome: Their Museums.”

February 8th and 15th.—“The Eastern Riviera.”

March 1st and 8th.—“The Upper Rhine.”

March 15th and 22d.—“The Lower Rhine.”

To the Members of the Museum and their friends, on Thursday evenings, as usual, at 8:15 o'clock:

February 20th.—“Naples, Pompeii and Rome: Their Museums.”

February 27th.—“The Eastern Riviera.”

March 6th.—“The Upper Rhine.”

March 13th.—“The Lower Rhine.”

On Thanksgiving Day Professor Bickmore repeated his lecture on the Pan-American Exposition of 1901 to the general public. This lecture has been given five times in the Museum, beginning with October 26th, and the record of attendance shows that 4,944 persons have heard it, the doors of the lecture hall being closed when all the seats were occupied.

On Christmas Day Professor Bickmore lectured in the Museum to the general public on “London: The ‘City’ and the Thames,” while on New Year’s Day he had “London: Its Museums and Galleries” for his subject. On Washington’s Birthday he will give an illustrated lecture on “The Rhine” to the public. No tickets are required for admittance to these lectures on the legal holidays, but the number in the audience is limited to the seating capacity of the hall.

BOARD OF EDUCATION COURSE.—The programme of illustrated lectures at the Museum during January and February under the auspices of the city Department of Education provides for lectures twice a week, continuing the plan inaugurated in

THE AMERICAN MUSEUM JOURNAL

October last. The lecturers and subjects for the Tuesday evening course are as follows:

January 7th.—W. E. MEEHAN,—“Greenland.”

January 14th.—MISS MARY V. WORSTELL,—“The Yellowstone National Park.”

January 21st.—EGERTON R. YOUNG,—“The Indians of the Wild Northwest: Their Haunts; Their Sports; Their Homes.”

January 28th.—F. S. DELLENBAUGH,—“The Cliff- and Cave-Dwellers of the Southwest.”

February 4th.—W. C. PECKHAM,—“The State of New York, and its Remarkable Natural Features.”

February 11th.—GEORGE W. BICKNELL,—“Flashes of Light on Yankee Land.” A description of Central New England.

February 18th.—JACQUES W. REDWAY,—“In the Heart of the Rockies.”

February 25th.—E. O. HOVEY,—“The Black Hills and Bad Lands of South Dakota and Wyoming.”

The programme of the course for Saturday evenings is as follows:

January 4th.—HARLAN I. SMITH,—“An Evening in the American Museum of Natural History.”

January 11th.—CHAS. L. BRISTOL,—“The New York Aquarium.” A description of the fine fish collection at the Battery.

January 18th.—MISS MARY V. WORSTELL,—“Bronx Park.” A description of the Park and the New York Botanical Gardens.

January 25th.—HENRY F. OSBORN,—“The Zoölogical Garden.” A description of New York's great Zoölogical Garden at Bronx Park.

February 1st.—W. T. ELSING,—“The Reign of Fire.” The first of a course of four lectures on “The Story of the Earth.”

February 8th.—W. T. ELSING,—“The Warfare of Water.”

February 15th.—W. T. ELSING,—“The Great Ice Age.”

February 22d.—W. T. ELSING,—“The Earth and Man.”

At the Board of Education lectures, given at the Museum during October, November and December, the official total attendance at the Tuesday evening course of eleven lectures was 15,924, and at the Saturday evening course of nine lectures, 5,409. The Saturday evening lectures were more technical in character than were those given on Tuesday evenings. The lecture on the Passion Play, October 22d, was heard by a thousand people more than could obtain seats in the hall.





THE HALL OF FOSSIL VERTEBRATES

THE HALL OF FOSSIL VERTEBRATES.

By W. D. MATTHEW, PH.D.,

Assistant Curator, Department of Vertebrate Palæontology.

INTRODUCTION.

WHEN we dig beneath the present surface of the ground we sometimes find remains of ancient cities, dwellings, bones of men and animals, buried many centuries ago under accumulations of debris, deposits of river mud or drifted sand. From these we learn many facts concerning the early history of mankind of which there is no written chronicle. From the study of these facts the science of Archæology has arisen, and it deals with the early history of mankind, with the evolution of civilization.

Most of the animals of which the archæologist finds traces are like those now living, although a few have become extinct. But in those more ancient deposits which are now consolidated into clays, sandstones etc., indications of man are not found, and the remains of animals which they contain are unlike any now living—the more unlike as the rock is more ancient. These remains are called *Fossils*. They consist only of the hard parts of animals (bones, shells, spines etc.). The soft parts are never preserved, and only very rarely is some trace of skin or hair, horns or hoofs, to be distinguished. As in the course of ages the mud or sand in which they are buried changes to rock, so little by little the fossils have been changed into a brittle, stony material, while retaining their outward form and usually their peculiar structure. But as mud and clay, in changing into rock, settle down and contract considerably, so also the fossils are flattened out to a corresponding extent—sometimes so much, in the case of a rock which has once been a soft oozy mud, that they suggest rather a picture or a bas-relief than the original form of the animal.

From fossils we can interpret the history of the world of life during the long ages before man appeared. The science which deals with the ancient history and evolution of the animal kingdom is Palæontology (*παλᾱίος*, ancient, *ὄντα*, living beings,

THE HALL OF FOSSIL VERTEBRATES

-λογία, science). It tells us of a long period of time before Man appeared, probably millions of years, during which Mammals of great size and unfamiliar form were the dominant animals—of a yet longer era before that, during which huge Reptiles were rulers of earth, sea and air—and of other more ancient periods during which Amphibians, Fish and Invertebrate animals held sway in turn. Vertebrate Palæontology deals only with the higher classes of fossil animals, the Vertebrata, or those that have backbones (fish, amphibians, reptiles, birds and mammals). For fossils of this kind the Bad-Lands of the Western States are the richest field, and from there came nearly all the specimens in this hall, the greater part of which have been found within the last ten years. The hall was opened in 1895.¹ At the time of writing, thirty complete skeletons of extinct animals have been placed on exhibition, besides many times that number of skulls, limbs and other imperfect specimens.

To give the visitor a clear idea of these extinct animals, the skeletons usually have been removed entirely from the rock in which they were found and have been mounted as much as possible like skeletons of modern animals; their probable appearance and habits are described by the labels and illustrated by water-color restorations. The especial interest of the hall lies in the fact that it shows so many of the data upon which are based the theories of Evolution. The arrangement of the specimens is intended to show the history or evolution of different races of animals, chiefly in North America. All the specimens of one race or kind of animal have been placed together, the most ancient first, the most recent last. All the skeletons in this hall are those of extinct animals.² The *Mastodon* and *Great Irish Deer* are half-petrified bone dug out of peat bogs. All the others are petrified (*i. e.*, they have been buried so long that they have been converted from bone into stone), and have been chiseled out of the solid rock. The *Megatherium* is a plaster cast, taken from bones from

¹ A brief history of the Department will be found in the number of this JOURNAL for November–December, 1901.

² Four small skeletons, those of the Raccoon, Cat, Opossum and young Lamb, have been placed in the cases near their extinct relatives, for comparison.

THE HALL OF FOSSIL VERTEBRATES

South America now in the museum of the Royal College of Surgeons, London. Some of the skeletons are partly restored in plaster, indicated by a red cross (restored bones) or red lines (outlines of restored parts of bones). Bones supplied from other specimens are marked with the catalogue number of the specimen or are indicated by a red circle, if uncatalogued.

GEOLOGICAL AGES AND PERIODS.

Cenozoic	Quaternary	Age of Man, 50,000 years
	Tertiary	Age of Mammals, 3,000,000 years
Mesozoic	Cretaceous	Age of Reptiles, 7,000,000 years
	Jurassic	
	Triassic	
Palæozoic	Permian	Age of Amphibians and Coal Plants,
	Carboniferous	5,000,000 years
	Devonian	Age of Fishes, 2,000,000 years
	Silurian	Age of Invertebrates, 10,000,000 years
	Cambrian	
Eozoic	Algonkian	(No fossils)
	Archæan	

These estimates in years of the geological periods given in the accompanying table, which is arranged in descending order from the most recent to the most ancient time, must be understood to be merely very rough approximations. There is no known method of finding any exact equivalent in years of any geological period, although the relative length of each to each is

THE AGE OF REPTILES

(MESOZOIC)

GEOLOGICAL FORMATIONS and CHARACTERISTIC ANIMALS.

THE AGE OF REPTILES PRECEDED THE AGE OF MAMMALS, AND IS REPRESENTED IN VARIOUS PARTS OF THE WORLD BY MARINE, ESTUARINE AND FRESH-WATER DEPOSITS DIVIDED INTO THREE GREAT PERIODS, TRIASSIC, JURASSIC AND CRETACEOUS.

DURING THIS AGE THE REPTILES APPEARED, FLOURISHED GREATLY, AND DECLINED AT ITS CLOSE TO THEIR PRESENT IMPORTANCE. THE MAMMALS APPEARED WELL DOWN IN THIS AGE BUT REMAINED SMALL AND SCARCE UNTIL ITS END.

PERIODS	FORMATIONS	TIME IN MILLIONS	CHARACTERISTIC ANIMALS
AGE OF MAMMALS	<p>TERRESON</p> <p>PUERCO</p>	<p>900</p>	<p>MAMMALS IN LARGE NUMBERS</p> <p>TRUE LIZARDS and SPHENODONS</p> <p>ALLIGATORS and CROCODILES</p> <p>TURTLES</p> <p>NUMEROUS BONY FISHES (TELEOSTS)</p>
	<p>LARAMIE</p> <p>MONTANA</p> <p>COLORADO</p> <p>DAKOTA</p>	<p>1000</p> <p>5000</p> <p>1200</p> <p>9700</p> <p>1000</p> <p>3000</p>	<p>CARNIVOROUS DINOSAURS</p> <p>HERBIVOROUS DINOSAURS</p> <p>HORNED HERBIVOROUS DINOSAURS</p> <p>NUMEROUS SMALL MAMMALS</p> <p>LAST PLESIOSAURS</p> <p>FIRST SOFT-SHELLED TURTLES</p> <p>WIDE-TAILED AMPHIBIANS (SALAMANDERS)</p> <p>BIRDS, PROBABLY TOOTHED PTERODACTYLS, TOOTHLESS</p> <p>MOSASAURS and PLESIOSAURS</p> <p>GIGANTIC MARINE TURTLES</p> <p>DOLICHOSAURIAN LIZARDS</p> <p>SHARKS, CAT-FISH, STURGEONS AND EEL FISHES</p> <p>TOOTHED BIRDS, TOOTHLESS PTERODACTYLS</p> <p>DINOSAURS</p> <p>MOSASAURS and PLESIOSAURS</p> <p>LARGE MARINE TURTLES</p> <p>BONY FISHES (TELEOSTS), SHARKS</p> <p>GANOID FISHES.</p>
AGE OF REPTILES	<p>COMANCHE</p> <p>WEALEDEN</p> <p>POTOMAC</p>	<p>400</p> <p>5000</p> <p>300</p> <p>2600</p>	<p>FIRST SNAKED</p> <p>TURTLES</p> <p>TRUE LIZARDS and DOUCHOSAURS</p> <p>HERBIVOROUS DINOSAURS (SQUAMODONS)</p> <p>CARNIVOROUS DINOSAURS (MEGALOSAURS)</p> <p>PTERODACTYLS, TOOTHED and TOOTHLESS</p> <p>MOSASAURS</p> <p>ICHTHYOSAURS and PLESIOSAURS</p> <p>CROCODILES, TURTLES.</p> <p>SHARKS and GANOID FISHES</p> <p>CHIMEROID FISHES</p>
	<p>PURBECK</p> <p>STOREFIELD SLATES (ENG)</p> <p>LIAS</p>	<p>1500</p> <p>4000</p>	<p>PRIMITIVE MAMMALS (MARSUPIALS, MONOTREMES) NO PLACENTAS (MOLLAGES)</p> <p>CARNIVOROUS DINOSAURS (CERATOSAURS)</p> <p>HERBIVOROUS DINOSAURS (ATLANTOSAURS)</p> <p>TURTLES, PTERODACTYLS</p> <p>FIRST BIRDS WITH TEETH (SAURURKS)</p> <p>ICHTHYOSAURS (TOOTHED, and TOOTHLESS)</p> <p>PLESIOSAURS, PTERODACTYLS (TOOTHED)</p> <p>SMALL, PRIMITIVE MAMMALS</p> <p>LONG NOSED CROCODILES (TELEOSAURS)</p> <p>ICHTHYOSAURS and PLESIOSAURS</p> <p>FIRST HERBIVOROUS DINOSAURS</p> <p>TURTLES, PTERODACTYLS</p> <p>SHARKS and CHONDROSTEAL FISHES</p> <p>REPTILE MAMMALS (TODONATHELIUM, TRITYLODON, MICROLESTES)</p>
AGE OF REPTILES	<p>WHARTON</p> <p>RICHMOND COAL BEDS and CONN and NEW JERSEY</p> <p>RED SANDSTONES (NEWARK SYSTEM)</p> <p>KREPPER</p>	<p>3000</p> <p>6000</p>	<p>FIRST CARNIVOROUS DINOSAURS</p> <p>LAST LABYRINTHODONTS</p> <p>PRIMITIVE CROCODILES (BELODON)</p> <p>FIRST TURTLES and PTERODACTYLS</p> <p>FIRST TELEOST or BONY FISHED</p> <p>SHARKS, CHONDROSTEAL and LUNG FISHES</p> <p>PLESIOSAURS, NOTHOSAURS</p> <p>FIRST ICHTHYOSAURS (MIXOSAURS)</p> <p>PLACODONTS</p> <p>LARGE AMPHIBIANS (LABYRINTHODONTS)</p> <p>FIRST PLESIOSAURS NOTHOSAURS</p>
	<p>WINTON</p>		
AGE OF AMPHIBIANS AND COAL PLANTS	<p>PERMIAN</p>	<p>600</p> <p>1000</p>	<p>FIRST REPTILES, COTYLOSAURS.</p> <p>PROGANOSAURS and PELYCOOSAURS</p> <p>PRIMITIVE AMPHIBIANS (STEGOCEPHALA)</p> <p>SHARKS, LUNG FISHES.</p> <p>CHONDROSTEAL</p>
	<p>CARBONIFEROUS</p>		<p>PRIMITIVE AMPHIBIANS (STEGOCEPHALA, MOSTLY SMALL SPECIES)</p> <p>PRIMITIVE SHARKS, LUNG FISHES</p> <p>CHONDROSTEAL and CROCODONTEUS FISHES</p>

THE TERTIARY FORMATIONS ARE REPRESENTED IN WESTERN AMERICA BY A SERIES OF DEPOSITS FORMED ON THE BOTTOM OF SUCCESSIVE FRESH-WATER LAKES, THEIR TOTAL THICKNESS IS NEARLY 12,000 FEET, REQUIRING PROBABLY TWO OR THREE MILLION YEARS TO FORM IN THE SEDIMENTS OF THESE LAKES WERE BURIED THE REMAINS OF MANY OF THE ANIMALS WHICH LIVED AROUND THE SHORES, LEAVING THUS A RECORD OF THE SUCCESSIVE SPECIES WHICH INHABITED THEM.

PERIODS	LAKE BASINS	THICK FEET	CHARACTERISTIC MAMMALS
RECENT AND PLEISTOCENE PLIOCENE	ELIJAH AND MILLER LAKE AND RIVER	150 10	ELEPHANTS, LAST MASTODONS, LAST GROUND SLOTHS, LAST SABRE TOOTH TIGES CAMELS, ONE TOED HORSES, CAVE BEARS, PECCARIES, TAPIRS, DOGS, WEASELS, BATS, GROUND SLOTHS, CAMELS, ONE TOED HORSES, FIRST TRUE FIRST TRUE CATS, TRUE INSECTIVORES
	LOUP FORK	400	MASTODONS, TRUE HORSELESS RHINOCEROSES, LAST CREODONTS, CAMELS, THREE TOED HORSE, DEER, FIRST PRIMITIVE MONY ANTILOPES
	DEEP RIVER	150	TRUE HORSELESS RHINOCEROSES, PRIMITIVE CAMELS, FIRST TRUE CATS, TRUE INSECTIVORES
MIocene			
	WINDY HILL NEW MEXICO	100	HORNLESS AND TWIN HORNED RHINOCEROSES, LAST ELOTHERES, CREODONTS, PRIMITIVE CAMELS, PRIMITIVE, DEER, RODENTS, DOGS, WOLVES, FOXES, CATS, SABRE-TOOTH TIGERS
OLIGOCENE	WHITE RIVER NEW MEXICO	1000	HYPOPTAMIOS, PROTOCERAS, PECCARIES, LAST CREODONTS, DOGS, WEASELS, BATS, INSECTIVORES, ELOTHERES, CURSALOID RHINOCEROSES, TAPIRS, FIRST THREE TOED HORSES, MESOCHIPPUS, SWIMMING RHINOCEROSES, AMYNOODONTS, LAST TITANTHOTHERES, CREODONTS, MONY ANTS, FIRST TRUE HORSELESS RHINOCEROSES, PRIMITIVE DEER, LAST PRIMATE, RODENTS, INSECTIVORES
	WINDY HILL NEW MEXICO	800	PRIMITIVE RHINOCEROSES AND AMYNOODONTS, TITANTHOTHERES, ELOTHERES, CREODONTS, FIRST CAMELS, FIRST CREODONT, TAPIRS, FOUR TOED HORSES, PRIMATE, RODENTS, LAST UNITATHERES, ONE LINE CREODONT, MAMMALS
			UNITATHERES.
	BRIDGE NEW MEXICO	2000	TITANTHOTHERES, PHALLOSCOPUS, TELMATHOTHERIUM, PRIMITIVE RHINOCEROSES (HYRACHYUS), FIRST ELOTHERES (ACHMODOON), LARGE CREODONTS (MESONYX), LATINE HORNEDS AND DEER-LIKE, MAMMALS, CREODONTS, FIRST TILLODONT, ARTIODACTYLES, HUMACODON, FOUR TOED HORSES (GRODIPPUS), LAST PRIMITIVE GROUND SLOTHS, PRIMATE, RODENTS, BATS, LAST TILLODONT
Eocene	WIND RIVER (WYOMING)	800	LAST CORYPHODONS, FIRST UNITATHERES, FIRST TITANTHOTHERES, LAST CONDYLARHS, FOUR TOED HORSES, PROTODRIPPUS, PRIMATE, CREODONT, RODENTS, BATS, TILLODONT
			AMBLYPODS, CORYPHODON, CONDYLARHS, PHENACODUS, FIRST FOUR TOED HORSES (HYRACHYOTHERIUM), FIRST TAPIRS, SYSTEMODON, FIRST ARTIODACTYLES, CLOVEN HOOFED ANIMALS, PRIMATE, MONKEYS, DEER, LEOPARDS
	WINDY HILL NEW MEXICO	2000	CREODONT, PRIMITIVE CARNIVORES, (RESEMBLING CATS, DOGS, BEARS), FIRST RODENTS, TILLODONT, INSECTIVORE, PRIMITIVE GROUND SLOTHS
	TORREJON NEW MEXICO	300	CONDYLARHS, PHENACODUS, AMBLYPODS, CREODONT, PRIMITIVE ECENTATES, FIRST PRIMATE, LAST TILLODONT
	PUERCO NEW MEXICO	500	CONDYLARHS OF PRIMITIVE HORNED MAMMALS, CREODONT, PRIMITIVE CARNIVORES, MULTITRUCULATES, MONOTREMES, PRIMITIVE ECENTATES, GROUND SLOTHS
	LA PLATTE	8000	
CRETACEOUS			

THE HALL OF FOSSIL VERTEBRATES

much more nearly known. The estimates given on page 5 are based on the very careful study of the subject made by C. D. Walcott, the present Director of the U. S. Geological Survey. In concluding his discussion Dr. Walcott stated his belief that the duration of geological time (the entire period included in this table) might be measured by tens of millions of years, but not by single millions or by hundreds of millions."

The most ancient of the extinct animals shown here are the creatures of the *Age of Reptiles*, such as the Dinosaurs, or great land reptiles, Mosasaurs, or great marine lizards, Ichthyosaurs, or fish-lizards, and other smaller animals. These are millions of years old. Some of the Dinosaurs are the largest known land



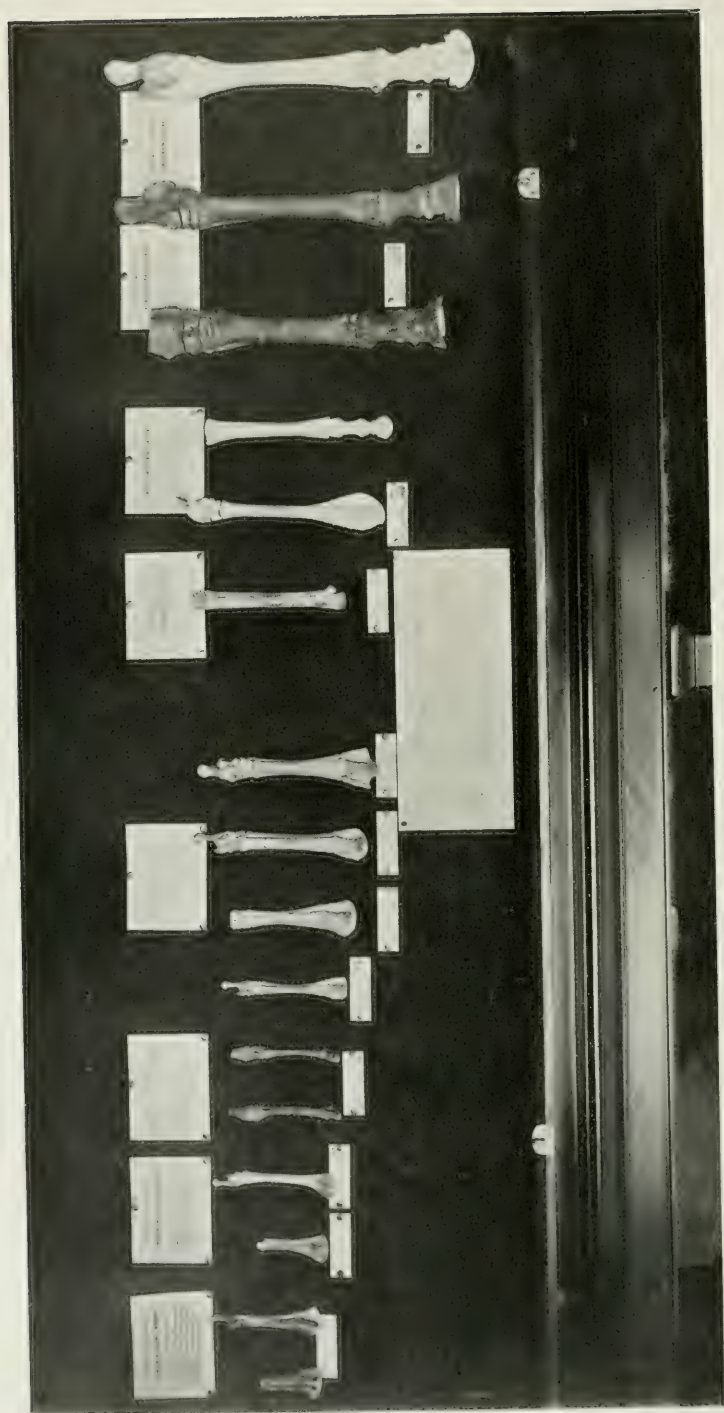
RESTORATION OF TITANOTHERIUM, AN EXTINCT HOOFED MAMMAL OF WESTERN AMERICA

The picture shows a bull, a cow and a calf

From the original watercolor, based on mounted skeleton and skulls in American Museum.

animals, longer than the width of the exhibition hall, and so tall that if they were standing on all fours their backs would reach within a few feet of the ceiling.

The greater part of the specimens are *Mammals*, or animals



EVOLUTION OF THE HORSE.—FEET

Photograph of the series of fore and hind feet in the American Museum, illustrating the Ancestry of the Horse

THE HALL OF FOSSIL VERTEBRATES

which suckle their young, including most four-footed beasts. Most of them lived during the Tertiary period, or *Age of Mammals*, and are hundreds of thousands of years old, ranging from perhaps three million years down; these lived long before man had appeared on the earth. A few, including the Mastodon, Mammoth, Megatherium, Irish Elk, One-toed Horse and others, are of the latest geological age, the Quaternary, or *Age of Man*, and, while tens of thousands of years old, were contemporaries of the earliest human beings.

Many of the extinct animals are allied to those which are still living and are called by the common names of their modern relatives. Thus we have extinct Horses, Rhinoceroses, Tapirs, Camels etc. Other races have died out completely and are not related to any living animals. *For these there is no popular name*, and we have to coin a name from their Latin or Greek scientific name, calling them "Titanotheres," "Dinosaurs" etc.

INSTANCES OF EVOLUTION.

The best example of the evolution of a race of animals is shown in the southeastern corner of the hall. Here is exhibited the *Ancestry of the Horse*, the specimens from successive geological strata showing how the Modern Horse has descended from diminutive ancestors with four toes on each forefoot and three on each hind foot, and with teeth and other parts of the skeleton different from those of their modern representatives.

Almost equally complete, although less familiar, is the series illustrating the *Ancestry of the Camel*, which may be found on the north side of the hall near the east end. These animals, like the Horses, evolved from small and primitive ancestors to large and highly specialized descendants, and then became extinct in their former home, the broad and arid plains of western America, before the advent of civilized man, but survived to modern times in other parts of the world. Less complete series are the skulls and skeletons illustrating the ancestors of Titanotheres and the ancestors of Rhinoceroses. These are ranged along the south side of the hall beginning at the entrance.

THE HALL OF FOSSIL VERTEBRATES

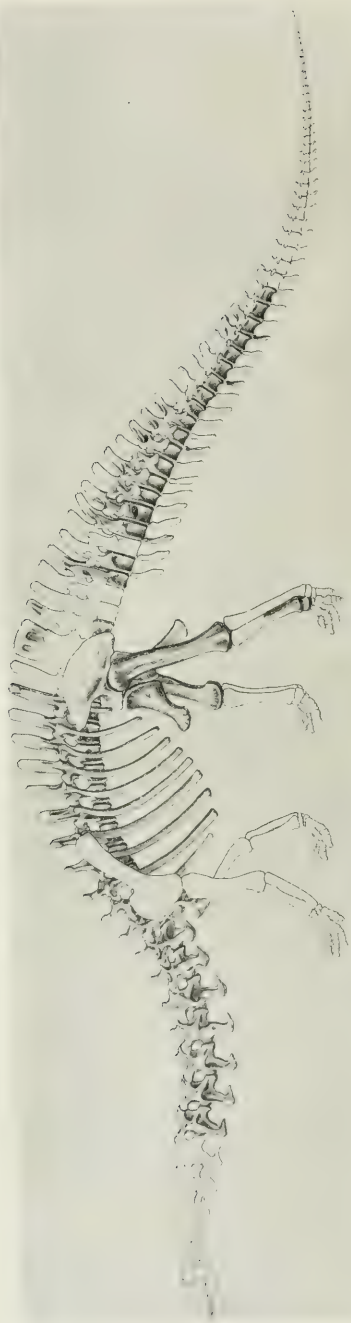
All these series have been placed according to geological age. The most ancient specimens, found in the lowest rock-strata, and hence representing the earliest stage of evolution, are placed first in the series. The most recent ones, found in the uppermost rock-strata, and representing the final stage of evolution of the race, are placed last. Arranging the species of a race from each stratum in the order of the age of the strata, we find that they show a regularly progressive change from the most ancient to the most recent. At no point in a given series can we draw a line and say: This is and that is not, a horse—or a camel—or a rhinoceros. The visitor, therefore, can demonstrate for himself the evolution of the race of Horses or Camels or Rhinoceroses, within certain limits. Of the evolution of Man we have no satisfactory illustration from fossils.

It should be observed that the evolution of a race consists mainly in the adaptation of the structure of the animals to particular surroundings and habits of life. There is also a universal progress in intelligence, the more ancient animals having relatively smaller brains than their successors.

ARRANGEMENT OF THE HALL.

FOSSIL MAMMALS.

On the north side of the hall next the entrance are arranged the Amblypods, ancient hoofed animals long ago extinct, unlike any living animal, although suggesting elephants, rhinoceroses, hippopotami and bears in different parts of the body (skeletons of *Pantolambda* and *Coryphodon*, skulls of *Uintatherium*). Next to them are the Condylarths, the most ancient of Hoofed Mammals, chief among them the *Phenacodus* skeleton, well known to students and figured in most geological text-books as the prototype of the Hoofed Mammals. Next to these are the Carnivora, or flesh-eating mammals, of which four fine skeletons are placed in the large "A"-case. Then come the Insectivora, or insect-eaters, and Rodents, or gnawers, represented by small and incomplete specimens. Then the Elephants (*Mastodon* skeleton, skulls of mastodons and mammoths) and the various kinds of Artiodactyls, or Cloven-hoofed animals, which are allied to modern



SKELETON OF BRONTOSAURUS

RESTORATION OF THE SKELETON OF A DINOSAUR, OR GIANT REPTILE

100 Natural Size. Modified from restoration by Prof. O. C. Marsh

The shaded portions represent the bones preserved in specimen No. 460 of the American Museum collection



PHOTOGRAPH OF THE SKELETON OF THE GREAT MARINE LIZARD IN THE AMERICAN MUSEUM

THE HALL OF FOSSIL VERTEBRATES

pigs and peccaries, camels, deer, sheep and cattle. Four skeletons and numerous incomplete specimens represent these last.

The south side of the hall is devoted chiefly to the Perissodactyls or Odd-toed Hoofed Mammals. First come the Titanotheres, an extinct group, once abundant in North America, whose evolution is here illustrated by two skeletons and a series of skulls; then the Rhinoceroses, also abundant in North America in former geological epochs, represented here by six complete skeletons and a large series of skulls; after these the Horses, whose evolution is illustrated by two skeletons and many skulls and feet. At the eastern end of the hall is a cast of the skeleton of the *Megatherium*, or great Ground Sloth, the largest of a singular group of mammals which inhabited South America until the advent of Man in that part of the world.

FOSSIL REPTILES.

The Dinosaurs, or giant reptiles, have been placed temporarily in two wall cases at the east end of the hall, and in the two high cases to the north of the centre aisle. Small models of restorations of three kinds of dinosaur will be found in an "A"-case near the east end of the hall, near the centre aisle.

These were the great terrestrial vertebrates of their day, the *Age of Reptiles*, and they assumed an extraordinary variety of forms, but all had long hind limbs and a long and massive tail. Some of the Sauropods (*e. g.*, *Brontosaurus*, *Diplodocus*, *Morosaurus*), four-footed, long-necked, herbivorous, probably amphibious, were beyond comparison the largest animals that ever trod the earth and can be compared in size only with the modern whales. Incomplete skeletons of these monstrous beasts are shown in this hall. Others, the Megalosaurus, were two-footed, carnivorous, preying on the clumsy giants (Sauropods) with which their remains are found associated in the rock. Others again, the Stegosaurus and Ceratopsians, or armored dinosaurs, were short-necked quadrupeds, massively proportioned, with back and tail covered by heavy bony plates and spines. Another group, the Ornithopods or Iguanodonts, long-limbed bipeds—or rather tripeds, for the long and massive tail formed a third support,—

THE HALL OF FOSSIL VERTEBRATES

had broad, flattened, horny bills like some gigantic duck. The knowledge of these strange animals has been gained chiefly from fragmentary specimens and has been hindered not a little by the—to our eyes—strange and inappropriate combinations of form. It is only within the last few years that complete or nearly complete skeletons have been found, and the preparation for exhibition of those possessed by this Museum is not yet finished.



RESTORATION OF THE FOUR-TOED HORSE

Oldest known Ancestor of the Modern Horse; only 16 inches high

Photo from original watercolor by C. R. Knight, based on mounted skeleton in American Museum

The *Mosasaurus*, or great marine lizards, are represented by the skeleton on the wall of the corridor by the staircase. Three *Ichthyosaurus* skeletons are placed on the opposite wall. This corridor will be filled ultimately with specimens of the great marine reptiles of the Mesozoic, or Age of Reptiles, which were in those times the tyrants of the sea, as the contemporary Dinosaurs were the giants of the land.

THE HALL OF FOSSIL VERTEBRATES

FOSSIL FISH.

In the corridor above the skeleton of the great Marine Lizard by the staircase will be found the skeleton of a great fish, obtained from the same geological stratum, and remotely allied to the Tarpon of the Florida coast.

ILLUSTRATING THE SPECIMENS.

The Watercolor Restorations by Charles R. Knight, done under the immediate supervision of Prof. Henry F. Osborn, the Curator of this Department, mainly based on complete skeletons



SCENE IN THE BAD LANDS OF THE UINTA BASIN—TERTIARY FOSSIL FIELD OF
NORTHEASTERN UTAH

exhibited in this hall, show the *probable appearance* of the different extinct animals, according to our best judgment, as indicated by the characters of the skeleton, appearance of their nearest sur-

THE HALL OF FOSSIL VERTEBRATES

viving relatives and the habits of life for which the animals seem to have been fitted. The general proportions of the animal, the outlines and form of head and body and, to a great extent, the expression of the features are usually accurately known from the fossil skeleton. The nature of the skin is sometimes but not often certainly known, and the coloring is always conjectural, the palæontologist and the artist having been guided by the coloring of living relatives and the supposed habits of the animal.

The Window Transparencies are enlargements from photographs of the regions where the fossils occur, and generally show the localities where unusually fine specimens in this hall were found. The Expeditions sent out yearly to the Fossil Fields carry with them a photographic outfit, and several hundred characteristic views have been taken, from which these have been selected. The Pillar Cards and general Labels in the cases give detailed information about each group of fossils. One of the cases in the centre of the middle aisle illustrates the method by which the fossils are collected and conveyed to the Museum. The Charts at each side of the entrance show the order in which the rock-strata lie, one over another, and the kinds of fossils found in each stratum.





UINTACRINUS SOCIALIS—Grinnell. FOSSIL CRINOID FROM KANSAS.

The American Museum Journal

VOL. II.

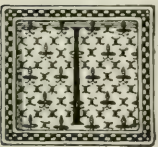
FEBRUARY, 1902

NO. 2.



THE JOURNAL presents with this issue a general Guide Leaflet to the Halls of Minerals which will be found of great assistance by persons visiting and inspecting the collections therein. Just before Thanksgiving Day last year the hall was opened, first to members of the Museum and their friends and afterwards to the general public, with the great acquisition of the Bement mineral collection all in place. This collection had long had the reputation of being the finest private collection of exhibition specimens of minerals in the world, so that the Museum authorities felt that they were indeed to be congratulated when a munificent friend of the institution somewhat more than a year ago presented the whole to the Museum, including the magnificent collection of meteorites, which is one of the largest assemblages in existence of those interesting visitors from space. Practically nothing but the Bement collection is now on exhibition in the desk cases of the Mineral Halls, but all the best specimens in the previous Museum collection have been retained and have been arranged in systematic order in the drawers of the desk cases, awaiting the time when more exhibition space shall be available for minerals.

A REMARKABLE SLAB OF FOSSIL CRINOIDS.



IN November, 1901, the Department of Geology and Invertebrate Palæontology received from Frank Springer, Esq., of East Las Vegas, New Mexico, the gift of a large slab of the fossil Crinoid which is known to science as *Uintacrinus socialis* Grinnell. This Crinoid is characteristic of the Niobrara Chalk



UINTACRINUS SOCIALIS—Grinnell. AN INDIVIDUAL FROM THE SLAB. NATURAL SIZE.

THE AMERICAN MUSEUM JOURNAL

horizon of the Upper Cretaceous of western Kansas. This slab, which is five feet four inches long and three feet two inches wide, in extreme dimensions, has been mounted and is now on exhibition in Panel 1 of Case P on the west side of the Geological Hall (No. 405) on the fourth floor of the Museum.

Crinoids belong to the same great subdivision of the animal kingdom as the common modern Starfish, but they are of a lower grade of organization. Some forms are provided throughout life with stalks, or stems, the lower ends of which are rooted in the mud of the sea-bottom or attached to some foreign object. Other forms, like the *Comatula* of the present seas, had such stalks during the very early stages of their existence, but lost them afterwards and floated free in the water. Crinoids seem to have been most abundant both in species and in individuals, during Lower Carboniferous (late Palæozoic) time, but, for the most part at least, they were stalked forms, leading a stationary existence. The free forms were more abundant later and now are very numerous, more than two hundred species of the family Comatulidæ having been described from the present ocean. *Uintacrinus* was a free form and has been found only in beds of Upper Cretaceous age.

The first specimen of the genus was found in 1870 by Prof. O. C. Marsh in the Uintah mountains in northeastern Utah. The Kansas specimens have added very greatly to our knowledge of these beautiful animals and have given Mr. Springer the material from which he has been able to complete the morphological studies of the genus made by Mr. F. A. Bather of the British Museum on European material. Mr. Springer's conclusions have been published in an elaborate memoir by the Museum of Comparative Zoölogy of Harvard University with several plates.

The investigations of Mr. Springer and others at the best localities show that these Crinoids lived in populous colonies in the quiet mediterranean sea or lagoon which occupied western Kansas in Cretaceous times. Those Crinoids that were at the lowest part of the floating mass rested directly upon the soft mud and settled into it in the positions in which they happened to be when the colony died. These were thus perfectly imbedded by

THE AMERICAN MUSEUM JOURNAL

the lower side in a fine matrix which preserved them like a mould. The other individuals of the colony settled down on top of these and, not having a soft or plastic bed to receive and preserve them, were crushed out of shape and disarticulated, and their component plates were indiscriminately mixed up. The whole mass was cemented together under pressure, forming a slab,—a thin layer of limestone as we now find it,—with the Crinoid bodies preserved only on its lower side. The largest of these lenticular layers of limestone was about fifty feet long and twenty feet wide with a thickness of half an inch in the middle, thinning out on all sides to the thinness of cardboard. More than twelve hundred specimens in which more or less of a calyx was shown were obtained from this deposit. The arms of these Crinoids are so mingled in the slab that it was impossible to free any of them, but some of them have been traced to a distance of forty inches from the body to which they belong.

The slab which the Museum has received from Mr. Springer shows distinctly at least sixty-five bodies, while fifteen or sixteen more can be made out under the covering of entangled arms. The body or calyx had thin walls, the plates of which were apparently connected by a sort of articulation or loose suture, so that it was more or less flexible and comparatively light in weight. All the calices have been flattened so that the opposite walls have been brought together in the form of a watch crystal.

E. O. H.

THE DEPARTMENT OF PUBLIC INSTRUCTION.



WO letters which have been recently received by Professor Bickmore give very gratifying evidence of the spreading influence of the Department of Public Instruction under his control. Persons who are in the habit of attending the lectures at the Museum know the popularity of the courses by Professor Bickmore and appreciate the superb character of the views thrown on the screen, but the extent to which these lectures and views are being used in the public schools of the State and the demand

THE AMERICAN MUSEUM JOURNAL

that there is for them outside of the State and the country are not so familiar to all. Light upon both of these points will be thrown by the following letters, the first of which came from an entire stranger to Professor Bickmore and gives an indication of what is going on in the schools of central New York.

PHELPS, N. Y., Dec. 23, 1901.

DEAR SIR:—

I began to give your lectures in the school chapel two years ago, using acetylene, but last year I got the building wired and now use electricity, which is more satisfactory. I first gave "Niagara Falls" to an audience mostly of scholars. Gradually my audiences have increased until now I have about 175-200 each night, of people who come each time and who are delighted with the views and the information gained.

I usually go over the views with your notes four or five times after my duties are over for the day and then read the notes, keeping in mind the slide described, until I know the principal facts of each view. I give a talk of about one and one-half hours.

I have given Egypt, Greece, Italy, Niagara, Cuba and Spanish War, Yellowstone National Park, Grand Cañon, Yosemite, Atlantic Coast, two on the Hawaiian Islands, one on the Philippines, Lesser Antilles and the Connecticut Valley.

At Clifton Springs and Shortsville, adjoining villages, similar courses are given [by the principals there]. If other parts of the State are doing the same, you are doing a great work in giving useful information to the people. I think greater efforts should be put forth to inform Union School Principals of the fact that they may obtain these views from cities and villages having a Superintendent.

Very truly yours,

(Signed) WILLIS A. INGALLS,

Principal of Schools.

The second letter is from the head of the school system of the Philippine Islands and shows the value placed there upon the stereopticon and first rate lantern slides in the work of instructing the Filipinos in regard to their new masters. The letter is an ex-

THE AMERICAN MUSEUM JOURNAL

cellent testimonial to the system of "visual instruction" which has grown up under the auspices of this Museum.

MANILA, November 11, 1901.

DEAR SIR:—

I have not forgotten the interesting visit which I made to your Museum before leaving New York.

We have just ordered nine magic lanterns and desire to present, in illustrated lecture form, as much information about American history and life as possible. What arrangements can be made with you to secure slides and what can we do as a return favor to you?

Considerable has been done in establishing schools and the Department now desires to give some attention to public libraries and public lectures, because they are very important supplementary educational agencies. Any suggestions that you may be willing to make will be very helpful.

With kindest regards, I am,

Very truly yours,

(Signed) FRED. W. ATKINSON,

Superintendent of Public Instruction
for the Philippine Islands.

THE ANDREW J. STONE EXPEDITION.



THE first season's work of the Andrew J. Stone Expedition has proved very successful and satisfactory. This expedition was organized early in the year 1901, and its work will continue during a period of three years, the means therefor having been generously contributed by public-spirited citizens of New York. It is under the leadership of Mr. Stone, who has several expert assistants to help carry on the work.

The purpose of this expedition is primarily to secure for the Museum good series of all the large game animals of North America, many of which are as yet unrepresented in its collections and are on the way to rapid extermination. The more prominent and interesting species will be mounted as groups with proper accessories and will form one of the most attractive features of

THE AMERICAN MUSEUM JOURNAL

the Museum collections. The smaller mammals and birds obtained by the expedition will be of special value to the Museum, since the more northern parts of the Continent are thus far very poorly represented here as regards the mammals and birds.

The season of 1901 was spent partly on the Kenai Peninsula and partly on Kadiak Island and the adjoining mainland of Alaska. Mr. Stone's assistants were Mr. J. D. Figgins of the American Museum and Mr. Maynard of Seattle, Washington. The collections comprise about forty large mammals, including good series of Caribou, Mountain Sheep and Moose, and of several species of Bear, besides several hundred small mammals and a large collection of birds

NEWS NOTES.

THE collections of the Department of Vertebrate Palæontology were enriched in January by the receipt of an excellent skull of the Woolly Rhinoceros (*Rhinoceros tichorhinus*) from the Pleistocene deposits of Russia. This specimen has come through Professor Alexis Pavlow and Madame Marie Pavlow of the University of Moscow, in exchange for material from the western United States, and will soon be placed on exhibition.

The skeleton of *Ichthyosaurus quadriscissus* which was noticed at length in the JOURNAL for October, 1901, has been further worked out of its rocky matrix, re-set and soon will be mounted in the corridor over the great Mosasaur skeleton.

The attention of visitors is called to the series of water-colors by Mr. Charles R. Knight, showing the different forms of the modern Zebra, and displayed in connection with the series illustrating the evolution of the Horse.

THE Department of Anthropology has received from J. D. Crimmins, Esq., the gift of a series of fifteen native Filipino hats. These were collected by his son, Lieut. Martin L. Crimmins, Sixth Infantry, U. S. A., who is now stationed on the Island of Pane, Philippine Islands.

THE AMERICAN MUSEUM JOURNAL

SOME of the material collected by Dr. Berthold Laufer in China, mentioned in the JOURNAL for January, has been placed on exhibition in the northeastern quarter of Hall No. 207, on the main floor of the building. The most striking objects are four ancient bronze drums, ancient and modern examples of carving, baskets and richly-embroidered garments and cloths. Only sixteen bronze drums of this character are known to be in existence.

THE Andrew Ellicott Douglas collection of celts and other Indian implements is being installed in the Tower Room at the extreme southwest corner of the main floor.

THE Section of Archæology has received an exchange from the Buffalo Society of Natural History, consisting of a representative collection from a village site in the southern part of Buffalo. This site was inhabited in historic times by the Seneca Indians, at whose head was the famous chief, Red Jacket. In prehistoric times the same site was occupied by the Kah-Kwahs, another division of the Iroquois people, who spoke a related language and had kindred customs. In the early days this site was neutral ground, because it was near the quarry of chert, the material which all tribes alike needed for making arrow-points. When the Senecas, however, secured guns and no longer used chert-pointed arrows, they captured the site from the Kah-Kwahs, an event which took place early in the seventeenth century. The present collection was made by Mr. Frederick Houghton, principal of one of the Buffalo schools, and is very complete. The implements represent both the Seneca occupation and that of the prehistoric Kah-Kwahs, and are accompanied by full information regarding the circumstances of their finding and their probable use. The collection is on exhibition in Hall No. 208, on the main floor of the building.

THE Anthropological Department has also received, as a gift from the Peabody Museum of Cambridge, Massachusetts, one of the Mexican codices which have been prepared through the liberality and under the editorship of Mrs. Zelia Nuttall.

THE AMERICAN MUSEUM JOURNAL

THE Department of Entomology has received from the Very Reverend E. A. Hoffman about six hundred and fifty specimens of butterflies from Australia, British New Guinea and other parts of the globe. All the forms are new to the collection, and there are many rare and beautiful species among them. Including this gift, the department received more than nine hundred specimens from this generous friend of the Museum during the year 1901.

THE Department of Geology has placed on exhibition on the tops of some of the cases containing the Jesup Collection of Building Stones on the ground floor of the Museum a series of specimens illustrating the building stones of Georgia. These specimens are in the form of handsome eight-inch cubes, with one face polished and the others finished in different styles to show the appearance of the material when treated according to several methods of the stone-dresser's art. The series comprises thirty-eight of these cubes, and includes gray, homogeneous granite of several shades, porphyritic granite and gneiss, sandstone, limestone and mottled and white marble. The collection was made for the State of Georgia by the State Geologist, Dr. W. S. Yeates, and has been exhibited at the expositions held at Atlanta, Nashville and Buffalo. It has been deposited in the Museum by the Geological Board of Georgia as an exhibit of the resources of the State in regard to building stones.

THREE important parts of the Memoirs of the Museum were issued in January as results of the explorations carried on by the Jesup North Pacific Expedition. They are, "The Traditions of the Quinault Indians," by Dr. Livingston Farrand, assisted by W. S. Kahnweiler, forming Part III of Vol. IV of the whole series of Memoirs; "Kwakiutl Texts," by Professor Franz Boas and George Hunt, forming Part I of Vol V; and "The Decorative Art of the Amur Tribes," by Dr. Berthold Laufer, forming Part I of Vol. VII. The Quinault Indians live on the coast of the State of Washington, while the Kwakiutl tribe lives in British Columbia. In the Memoir, the Kwakiutl texts and the English translations thereof are arranged in parallel columns. Dr. Laufer's paper is

THE AMERICAN MUSEUM JOURNAL

elaborately illustrated with thirty-three plates, some of which are in colors, and twenty-four text figures.

THE official record shows that 50,607 persons visited the Museum during the month of January, 1902.

LECTURE ANNOUNCEMENTS.

DURING March the following lectures will be delivered at the Museum by Professor Albert S. Bickmore:

To Teachers in the Public Schools: Saturday mornings at 10.30 o'clock:

March 1st and 8th.—“The Upper Rhine.”

March 15th and 22d —“The Lower Rhine.”

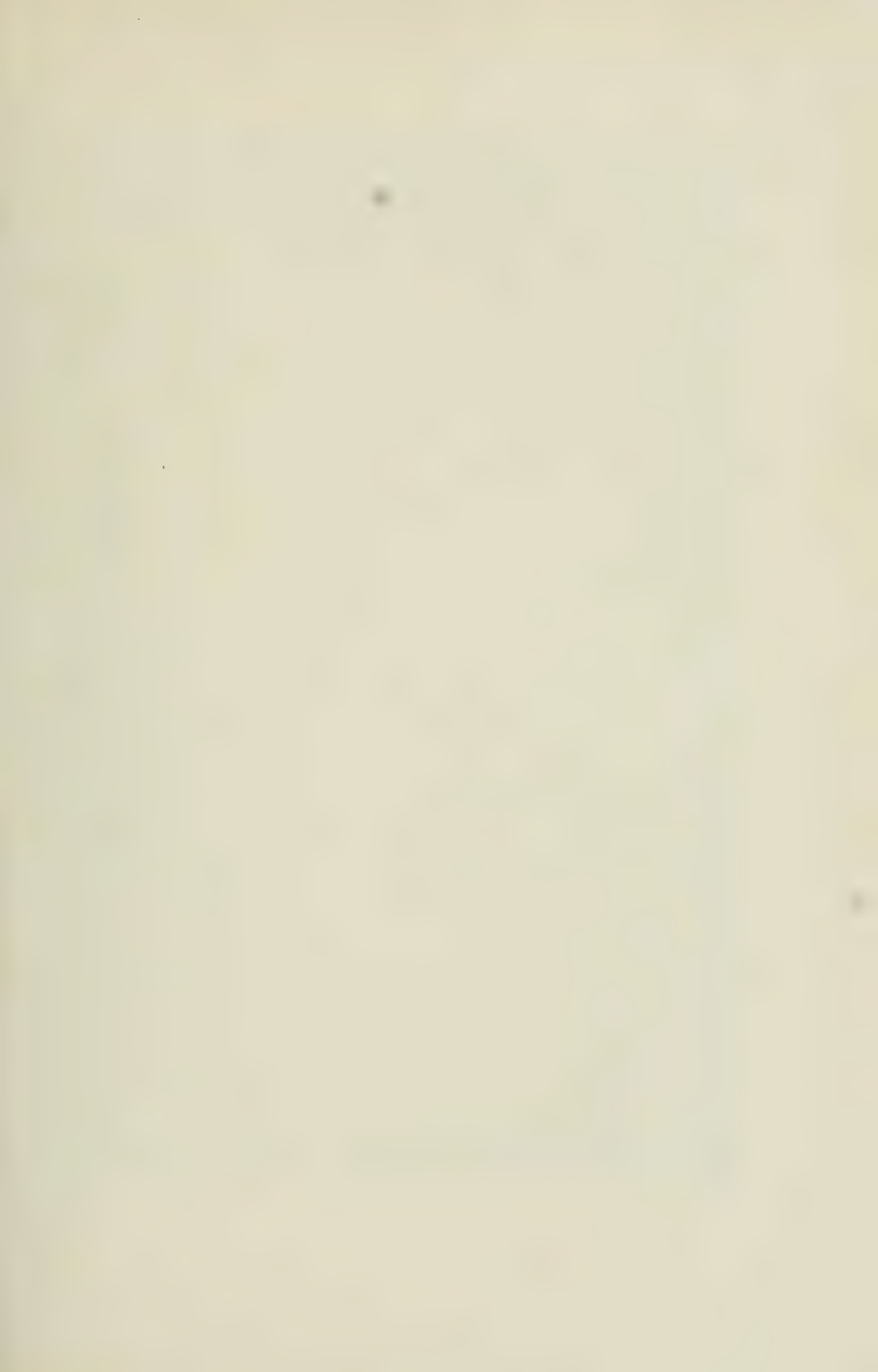
To the Members of the Museum and their friends, on Thursday evenings at 8.15 o'clock:

March 6th.—“The Upper Rhine.”

March 13th.—“The Lower Rhine.”

The illustrations for these pictures have been prepared from negatives taken last summer expressly for Professor Bickmore.

THE lectures given under the auspices of the City Board of Education will be continued throughout the month on Tuesday and Saturday evenings at 8 o'clock precisely.





THE MAIN HALL, DEPARTMENT OF MINERALOGY

THE COLLECTION OF MINERALS.

BY LOUIS P. GRATACAP, A.M.,

Curator, Department of Mineralogy.

INTRODUCTION.

MINERALS, in the broad sense in which science uses the term, include the air, the natural gases, water and the results of change in plant structures, such as coal, oil and resins. More popularly defined, minerals are those stony components of the earth which are to be found in its rocks and their crevices and which present similarity to one another in such characteristics as color, form and hardness. Most observers can easily separate Quartz from Calcite. In making the separation they associate with the idea of Quartz a certain lustre and hardness, a peculiar brittle and irregular fracture and, when the mineral is crystallized, a typical form quite in contrast with the same features in Calcite. A brilliant lemon-yellow crystal, or even a compact mass of Sulphur, is quite distinct in appearance from a greasy, black crystal or nodular piece of Graphite. The obvious physical characters of one are so different from those of the other that the most cursory examination serves to distinguish them as independent substances.

Such striking contrasts, however, do not exist generally in the mineral kingdom, and the observer usually is obliged to give more than a superficial examination to a mineral specimen in order to determine what it is. Most of the common minerals may be differentiated by simple tests with blowpipe and file, but all the rest, and they form by far the largest part of the whole number of species, must be examined by more elaborate chemical and physical means for their exact determination.

The collection of minerals to which this Guide Leaflet is an introduction, though large and comprehensive, cannot be considered an exhaustive representation of the mineral kingdom. It combines, however, in almost equal degrees the elements of

THE COLLECTION OF MINERALS

beauty, scientific interest and educational use. The æsthetic influence of a collection of minerals need not be dwelt upon. It is evident that minerals are beautiful in their colors, in their varied forms and, sometimes, in the extreme delicacy of their development.

THE HISTORY OF THE COLLECTION.

The growth of the Mineral Collection of the American Museum has been gradual. Its nucleus was the Bailey collection, which contained many of the more common minerals and, while not conspicuous for beauty or completeness, was a fairly representative series serving very well the purpose of an introduction to mineralogy. The Spang collection was purchased in 1891 and more than doubled the number of specimens of minerals in the Museum. This acquisition, furthermore, added a large number of new species, and in many groups increased the variety and richness of form represented.

Previous to the purchase of the Spang collection, a very remarkable group of specimens of Malachite and Azurite (the green and blue carbonates of copper) had been presented to the Museum by the Copper Queen Consolidated Mining Company of Arizona. This unique and very striking assemblage of specimens, together with later additions from the same source, is now installed in the large single case at the north end of the smaller hall (lettered "B" in the diagram).

In the ten years following the acquisition of the Spang collection, many valuable gifts were added to the Museum's series, but preëminence among the exhibition collections in the country was not attained until the close of 1900, when J. Pierpont Morgan, Esq., purchased the Bement collection of minerals and meteorites and presented it to the Museum. This remarkable collection was brought together by Mr. Clarence S. Bement of Philadelphia. It is the result of the careful expenditure of a great deal of money, the purchases having been directed by exquisite taste as well as by scientific judgment. Although the Bement collection contains many rare species, its widespread fame has rested upon the variety of forms representing the com-

THE COLLECTION OF MINERALS

moner minerals and the exceptional perfection of the specimens. The present Museum collection is the combination of the material from all these sources, but owing to lack of space the Bement collection only is on exhibition, except in the wall cases.

CLASSIFICATION.

The classification of minerals in an exact sense was impossible as long as mineralogists adopted artificial systems based solely on color, hardness, source, weight or fanciful external resemblances. Only as the science of chemistry developed and as better methods of analysis were devised could a philosophical classification of minerals become possible. To chemical law mineralogy has adhered more and more closely, and while, to some extent, minor groups are founded upon crystallographic identity or similarity, the underlying basis of classification throughout is chemical composition. Minerals of the same chemical type are grouped together, and under that type minerals of similar physical or crystallographic features are arranged in smaller subdivisions. The forms of minerals are their most obvious characteristic. The six-sided prisms of Quartz and Beryl crystals, the rhomboidal or trapezoidal faces of Garnet, the triangular faces of Magnetite and the square faces of Fluorite are unmistakable. Observation at last passed beyond the first stages of curiosity or admiration and, slowly helped by many early students, and rapidly advanced by the genius of two or three, the branch of mineral science known as Crystallography has developed. Crystal form, furthermore, has been found to have close dependence upon chemical composition.

In the development of the nomenclature of the science the form of the names instituted by the ancients has been retained, and the termination *-ite*, derived from the classic Greek *-itis*, meaning *belonging to*, prevails. For example, Hematite, from the Greek word for blood, alludes to the red color of one mineral; Chlorite, to the green color of another, and Siderite, from the Greek word for iron, has reference to the chemical nature of a third. Several names which are exceptions to the rule, such as



SULPHUR FROM CIANCIANI, ITALY

THE COLLECTION OF MINERALS

Garnet, Idocrase, Quartz, Mica, Gypsum, Corundum and Spinel, have been so long in use that, like the names of the metals and elements, they must be retained.

According to chemical composition, therefore, the following principal subdivisions of minerals have been established:

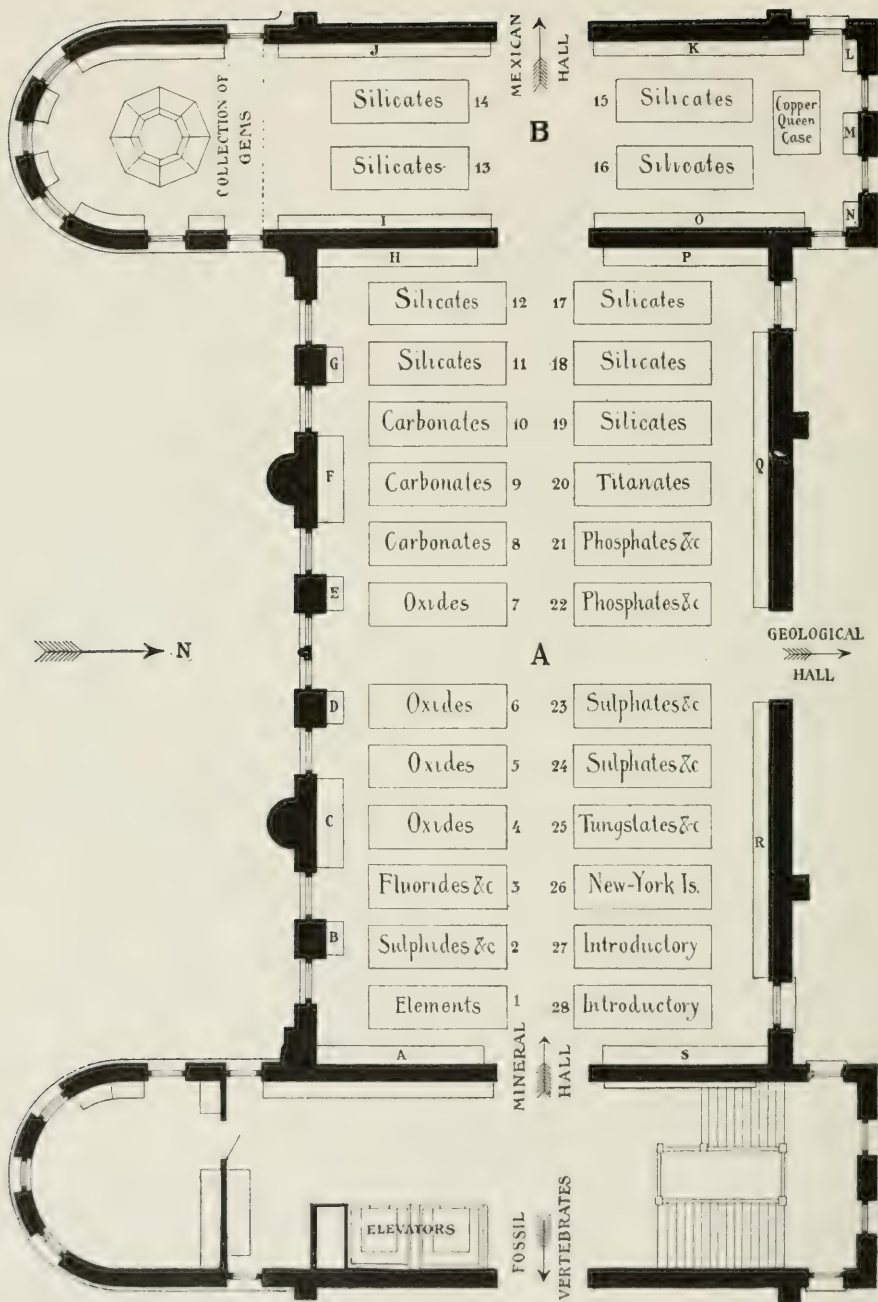
- I. The Native Elements.
- II. The Arsenides, Sulphides, Antimonides, Sulph-arsenides, Sulph-antimonides and similar compounds.
- III. The Haloids.
- IV. The Oxides, anhydrous and hydrous.
- V. The Oxygen-salts, such as Carbonates, Silicates, Phosphates, Columbates, Tantalates, Sulphates and Nitrates.
- VI. The Hydrocarbons.

This system is almost universally used to-day, with changes, however, more or less material in the succession and interpretation of its various parts, and is practically the production of the last century.

Owing to the early activity of chemical agencies and the still continuing energy of oxygen, a gas which is constantly attacking uncombined elements, the list of Native Elements, as at present known, is much shorter than the list of elements known to chemistry, a large number of them being precluded from any independent existence whatever through their strong affinities for other substances. The mineralogist finds, however, in the portions of the earth accessible to him, a small list of native elements, of which six, at the most, are characteristically uncombined, while the remainder, about fifteen in number, are found native only under exceptional conditions, and one of them, iron, is particularly interesting because its most frequent occurrence is in the form of meteorites.

GUIDE TO THE COLLECTION.

The collection of minerals is exhibited in two halls on the fourth floor of the Museum, marked "A" and "B" on the diagram, and is displayed in two sections, the wall case and the desk case exhibits. The wall cases contain those specimens which are



PLAN OF HALLS, DEPARTMENT OF MINERALOGY

THE COLLECTION OF MINERALS

too large for the desk cases, but the arrangement in the two series is the same. The systematic series in the desk cases is naturally far more complete than that in the wall cases. The specimens are arranged in accordance with the classification given in the sixth edition of Dana's System of Mineralogy, and the series in the desk cases begins at the left of the entrance to Hall A. It is intended to be studied from left to right along each side of every case, so that one advances from west to east along the south side of the hall, enters the small hall, B, and returns along the north side of the large hall to the end of the series at Case 25. Case 26 contains a collection of the minerals of New York and vicinity, and Cases 27 and 28 contain introductory series presenting the chemical and physical features of minerals, together with explanatory tables and photographs. The meteorites of the collection are now to be found in Cases 25 and 27, but they are soon to be arranged by themselves in cases along the center of the hall. At the head of every scientific subdivision will be found a statement, called here a "Rubric," detailing the principal members of the group, and giving their chemical composition and system of crystallization.

In the Museum collection the Sulphurs, Golds and Coppers are the most striking examples of the Native Elements.

The Sulphur specimens (Desk Case 1 and Wall Cases F and J) arrest attention on account of their beauty and perfect preservation. The crystallographic habit of the mineral is well known, steep pyramids beveled by the narrow planes of more obtuse pyramids, generally broad basal pinacoids, prisms, domes, hemipyramids and frequent sphenoids. An examination of the crystals will generally reveal upon the large brilliant faces curiously wrinkled and clouded surfaces which, under a magnifying glass, show densely crowded pits and irregular etchings. The sulphur deposits of the earth usually are found in connection with gypsum beds or near active or extinct volcanoes. The sulphur has been produced by separation from sulphuretted hydrogen. The mineral is found in large deposits in Wyoming, Nevada, southern Utah, and California.

Particularly choice are the specimens of Gold. The mineral is

THE COLLECTION OF MINERALS

shown here (Desk Case 1) in sheets like rolled metal; in plates, with crystallized edges; in braided filaments made up of minute octahedrons; in grouped octahedrons with hollow faces; in twisted plates frequently attached to quartz, around which it curls like some irregular yellow flower. Gold, from an elongation of the octahedron, assumes deceptive forms, while cavernous, skeleton and pitted crystals, peculiar distortions, reticulated and tree-shaped groups with spongy masses and rounded water-worn nuggets are common natural appearances of this precious metal.

Copper (Desk Case 1) is of especial interest, on account of the beautifully crystallized specimens in which it occurs. Most of our specimens have come from the remarkable deposits of Native Copper in the Lake Superior region of Northern Michigan. They exhibit the characteristic crystal forms of the metal, sprigs and branching crystals, twins and massive plates, the common tetrahedron, cubes and superimposed octahedrons. Here will be found also examples of Copper and Silver which have been welded together by nature.

The next group of minerals is that comprising the Sulphides, Selenides and Tellurides of the metals and semi-metals, and the Arsenides and Antimonides of the metals, which are again succeeded by the so-called Sulpho-salts, in which the union of sulphur with arsenic or antimony is regarded as an acid, chiefly forming compounds with the bases, copper, silver, lead, iron, zinc and mercury. The great variety and number of mineral species resulting from the combinations thus made possible, are for the most part the source of many useful metals, and these combinations characterize the veins, crevices, fissures, caves and beds of mining regions.

One of these, Stibnite, the sulphide of antimony, is a valuable ore (Desk Case 1, Wall Case F). This species affords the mineralogist very beautiful, lustrous, well-terminated prismatic crystals, usually clustered in radiating groups. The striking specimens here displayed, together with many others which have supplied the cabinets of the world, were found at Mt. Kosang near Seijo, province of Iyo, Shikoku Is., Japan. In their size and beauty and

THE COLLECTION OF MINERALS

in the complexity of their forms, they surpass the specimens of the same species from all other localities. They increased the number of known crystalline planes of Stibnite from forty-five to eighty-five. Galenite, the sulphide of lead, and Sphalerite, the sulphide of zinc, are represented by beautiful specimens in Desk Case 2 and Wall Cases F and J. Pyrite, the sulphide of iron (Desk Case 2, Wall Case H) is a very common species, and is very strik-



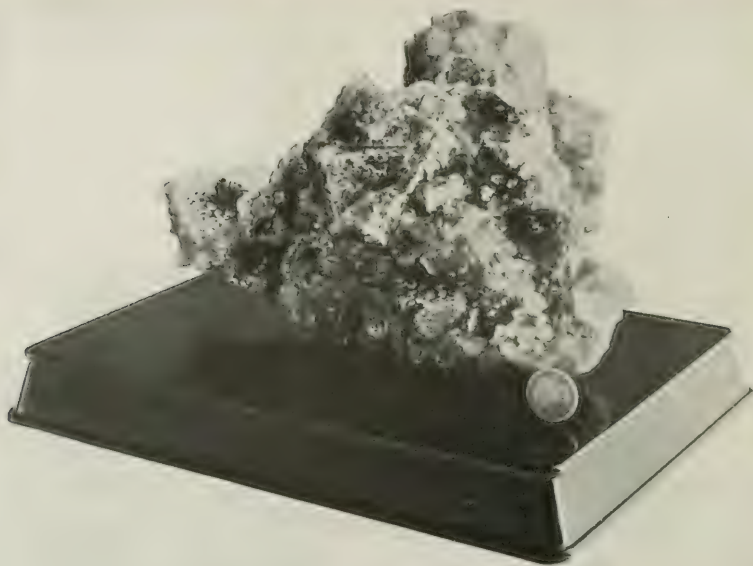
STIBNITE FROM MT. KOSANG, JAPAN

ing on account of its brilliant cubes, dodecahedrons and other crystal forms.

The group of Haloid compounds follows the foregoing division, and is composed of the unions of the elements chlorine, fluorine, iodine and bromine with basic atoms of the metals. The admixture of oxygen produces oxy-salts, and of combined water makes hydrous salts. In this section Fluorite is prominent (Desk

THE COLLECTION OF MINERALS

Cases 3 and 4, Wall Cases H and J). In every large collection this mineral offers a splendid display of colors and associations, and in the Bement collection the series of specimens is especially attractive. From Cumberland, England, there are elongated cubes with attached Calcite crystals; large cubes coated with crystals of Quartz; purple and green cubes densely ruled with fine lines, which indicate oscillations of crystal development;



FLUORITE COATED WITH QUARTZ, CUMBERLAND, ENG.

green cubes from Cornwall with feathery edges of purple, inclusions of black specks and interior colored boundaries (phantoms); also from Brienz, Switzerland, crystals with low scallop-like depressions, pyramidal pits, wrinkling lines and pin-holes, the whole resembling an eroded or half melted ice-block; from Saxony, yellow cubes with Galenite; magnificent pink octahedrons from Switzerland, some of them with blunted or rounded angles made by the planes of the trigonal trisoctahedron.

The Oxides follow the simple compounds of the metals and



QUARTZ FROM MAGNET COVE, ARKANSAS

THE COLLECTION OF MINERALS

semi-metals and represent the combination of oxygen with metallic bases. They form one of the most important classes of minerals, and among them are found many of the valuable ores, while Quartz, the oxide of silicon, is the most widely distributed of all the rock-making minerals. In this section, Hematite, Corundum, Spinel, Magnetite, Franklinite and Rutile present some of the most brilliant phases of the mineral world (Desk Cases 6 and 7, Wall Cases I and J).

Quartz, including the chalcedonic forms of silica (Desk Cases 4 and 5, Wall Cases H, J, K, P), is the most prized, the most beautiful and the most varied of all minerals. In color, form and physical constitution, it assumes so many aspects, and the changes from one form to another are so gradual that its complete illustration is almost impossible. It crystallizes in the hexagonal system and usually has the form of a six-sided prism terminated by a pyramid. In the Bement collection its great diversity of development is well shown. Quartz occurs in easily visible particles in granite and many other igneous and metamorphic rocks, in sandstones and quartzites and, as a deposit from aqueous solution, in cavities and crevices in all kinds of rocks. It is the common vein material of mountainous and ore-bearing regions. The absorption of iron and other metallic oxides produces many colors, especially in the various chalcedonic forms of silica.

Following the Oxides are the Carbonates, which form a very important group. The carbonates of lime and magnesia constitute the limestones, while the carbonates of iron and copper are valuable ores. On account of their beauty, many Carbonates,—for example, Marbles, Malachite, Azurite and Mexican Onyx,—take a conspicuous position in a mineral cabinet. The carbonates have been formed by the combination of carbon dioxide with various bases, and the union in many instances has been brought about through the agency of water carrying the carbon dioxide in solution. This has dissolved the base of the salt, the whole being re-deposited afterward from a more or less saturated fluid on a further change of conditions.

In this series the Calcite, Aragonite, Malachite, Azurite, Sider-

THE COLLECTION OF MINERALS

ite and Rhodochrosite specimens furnish a long display of forms and colors (Desk Cases 8-10, Wall Cases I, J, K, O, Q).

The Silicates embrace the larger number of mineral species and are the essential components of the crystalline rocks. They are unions of basic elements (the oxides of various metals) with the several forms of silicic acid. The group is subdivided into

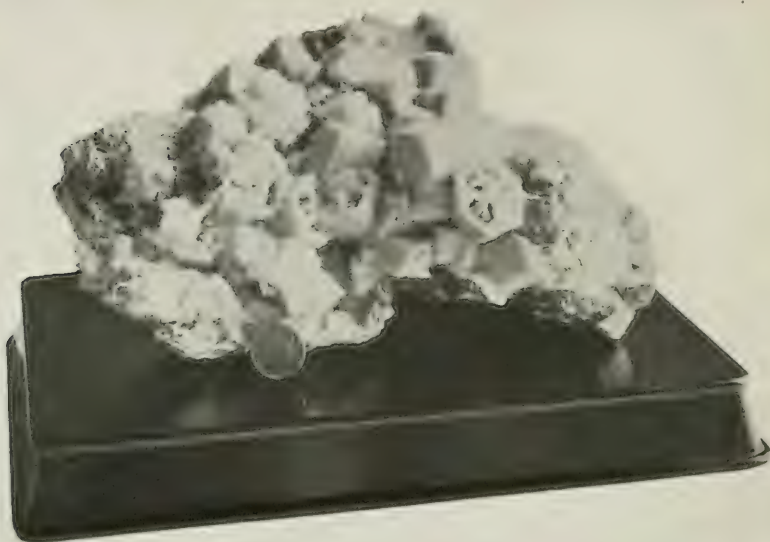


AZURITE FROM BISBEE, ARIZONA

two sections: the Anhydrous and the Hydrrous Silicates, and these again are broken up into smaller groups based upon similarity of their members to one another in regard to composition, crystallization and optical qualities. Among the Silicates there are several well-marked and compact groups, such as the Feldspars, the Pyroxenes, the Amphiboles, the Garnets, the Sodalites and the Scapolites.

THE COLLECTION OF MINERALS

A chemical feature of the greatest importance in the constitution of the silicates is the replacing power of the bases, whereby one or more basic molecules take the place in whole or in part of another in the chemical composition of a mineral. For instance, the sesquioxide of alumina (Al_2O_3) can be replaced by the sesquioxide of iron (Fe_2O_3), except in the feldspars; and, similarly, lime (CaO), magnesia (MgO) and protoxide of iron



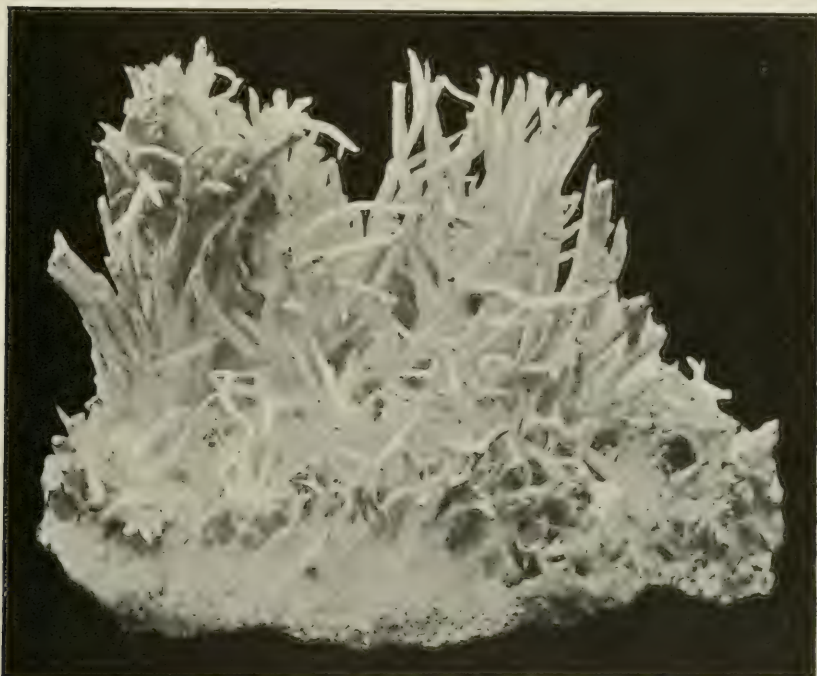
CALCITE PSEUDOMORPH AFTER ARAGONITE, CIANCIANI, ITALY

(FeO) are substituted for one another; or any of these can take the place of the oxides of potassium and sodium (K_2O , Na_2O). This replacing process comes prominently into view in Garnet, in which with the same theoretical formula for a very large group the composition of the different varieties is different through the effect of this law. Another, and simpler, instance is the series of compounds connecting Siderite (FeCO_3) with Calcite (CaCO_3).

Among the silicates may be mentioned Feldspar (Desk Case 11, Wall Cases K and O), Pyroxene (Desk Case 11), Amphibole

THE COLLECTION OF MINERALS

(Desk Case 12), Beryl (Desk Case 12, Wall Case O), Garnet (Desk Cases 12 and 13, Wall Cases K and O), Zircon (Desk Case 14, Wall Case K), Topaz (Desk Case 14, Wall Case K), Tourmaline (Desk Cases 15 and 16, Wall Case Q), the Zeolites (Desk Cases 16 and 17, Wall Case Q), Mica (Desk Case 18, Wall Case Q), Serpentine (Desk Case 19, Wall Case Q), and Talc (Desk Case 19,



ARAGONITE ("FLOS-FERRI") FROM STEIERMARK, AUSTRIA

Wall Case Q).. Besides these there is a host of less important species. In Wall Case K may be found a beautiful example of Rhodonite, the silicate of manganese. This interesting mineral has a remarkable development in the zinc area of northern New Jersey, and the exceptional group of prisms illustrated on page 19 is from Franklin in that State.

Beyond the silicates are the salts, or compounds with bases, of the other oxygen acids. Here come in order the Titanates,

THE COLLECTION OF MINERALS

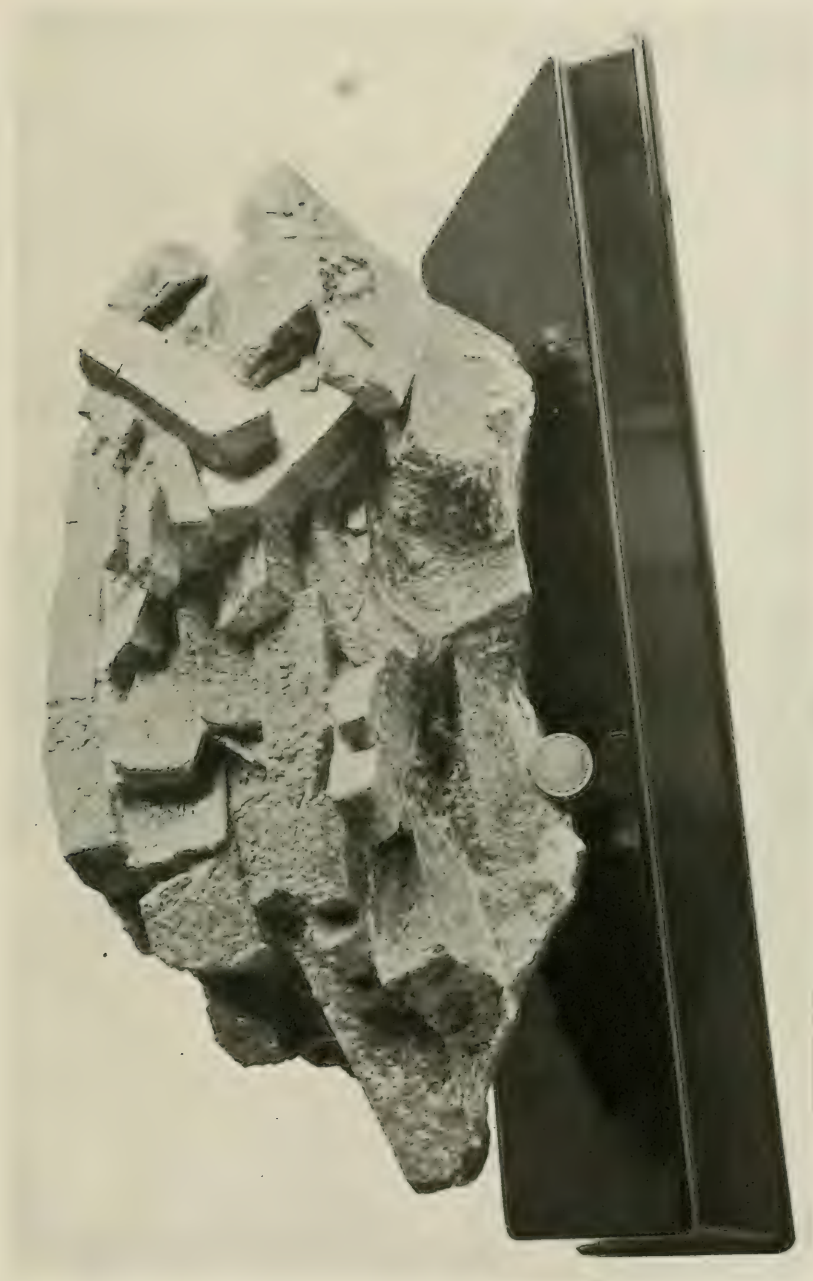
Phosphates, Vanadates, Arsenates, Antimonates, Columbates, Tantalates, Borates, Tungstates, Molybdates, Sulphates, Chromates and Nitrates. These are to be found in Desk Cases 20-25 and in Wall Case Q, but it is impossible in this brief review of the collection to dwell upon the interest and beauty of the many species assembled in this section.

Prominent among them, on account of the great beauty of



MALACHITE FROM BISBEE, ARIZONA

its mineralogical development, is the sulphate of barium, or Barite, (Desk Case 23, Wall Case Q). This is a handsome species not remarkable for crystalline variety, but often grouped in sheaves of radiating plates, frequently massive and banded, occasionally globular, fibrous or granular. The crystals are commonly tabular, somewhat modified on the edges, and frequently are tinged yellow, red, green, blue or brown. Barite is found in metallic veins and is of especially common occurrence in lead



RHODONITE FROM FRANKLIN, NEW JERSEY

THE COLLECTION OF MINERALS

mines. In recent years extraordinarily beautiful specimens of this mineral have been found in England.

As the visitor completes this preliminary survey of the Hall



BARITE FROM CUMBERLAND, ENGLAND

of Minerals, it is suggested that he review his impressions in the light of these general reflections:

First, that in the inorganic or mineral world the forces governing the molecular arrangement of matter in crystalline forms, and the affinities governing the chemical combination of elements, rule universally;

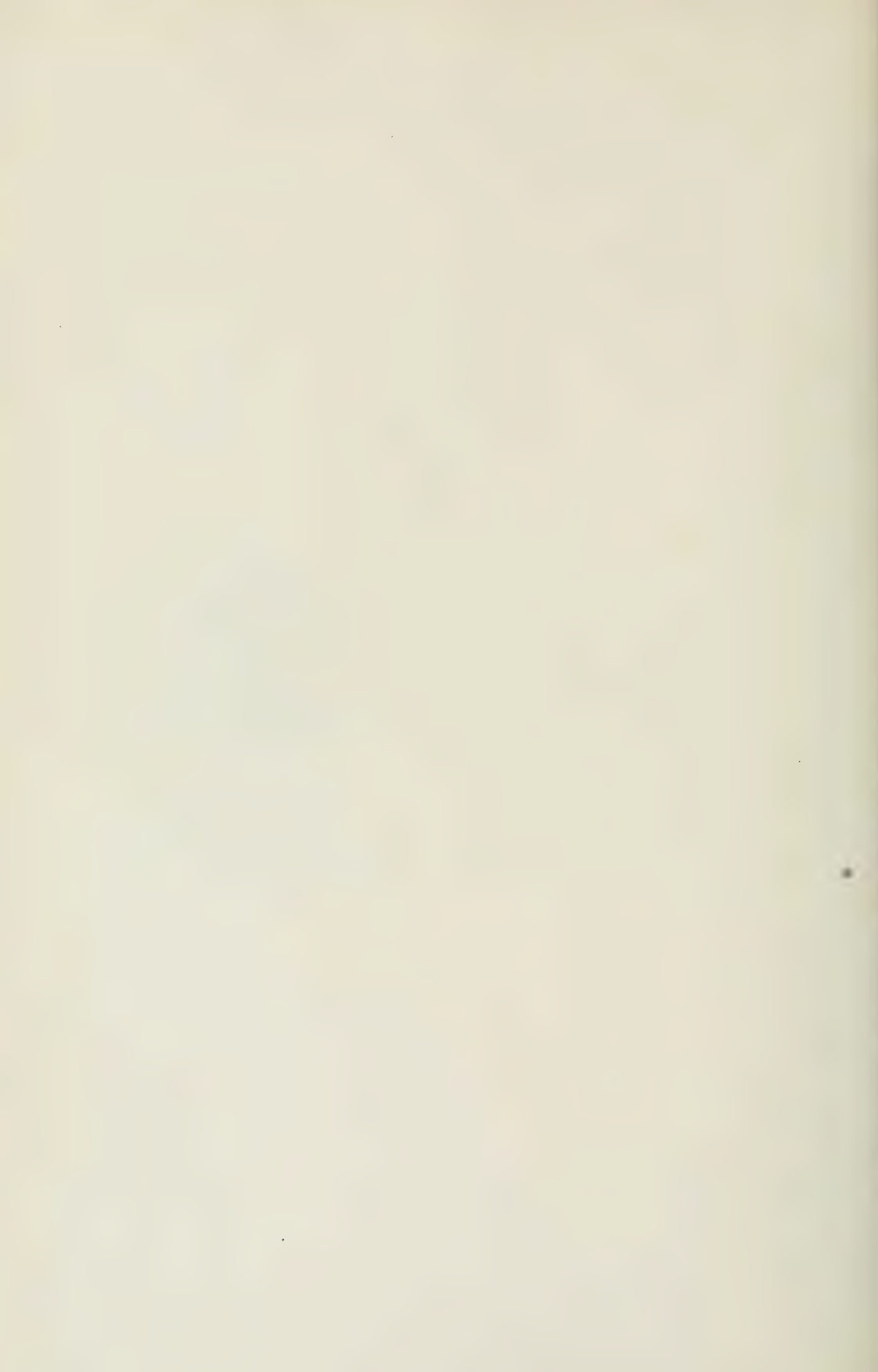
THE COLLECTION OF MINERALS

Second, that the minerals of the earth's surface necessarily are the sole source of all the elements useful in the industries and the arts;

Third, that minerals appeal to our sense of beauty, and are as much to be regarded as objects of artistic appreciation as are the beautiful colors and forms of the animal creation.



BARITE FROM CUMBERLAND, ENGLAND









A FOSSIL ARMADILLO FROM TEXAS

The American Museum Journal

VOL. II.

MARCH, 1902

No. 3.



THE Annual Meeting of the Trustees of the Museum was held on Monday evening, February 10. The report of the Treasurer showed that there had been disbursed for maintenance, \$147,773.75, which was \$17,773.75 more than had been appropriated for this institution by the City. The deficit, however, had been met by the contributions of the Trustees, which enabled the Museum to begin the current year free of debt. The subscriptions for the increase and improvement of the collections and for publication amounted to \$141,452.13, of which \$37,500 was received from the Trustees and \$11,500 was derived from gifts made by numerous other contributors. The remainder of the sum total was in the nature of funds subscribed for expeditions in the field, for specific branches of the Museum's work and for the purchase of special collections.

The expeditions maintained during 1901 were the Jesup North Pacific expedition; the Hyde expeditions in the southwestern States and in Mexico, supported by Messrs. B. T. Babbitt Hyde and F. E. Hyde, jr.; expeditions for archæological research in the Delaware Valley, supported by Dr. Frederick E. Hyde; the Mexican expedition under the patronage of the Duke of Loubat; an expedition in the Far East for the collection of material illustrating the life and customs of the Chinese; an expedition throughout the western States in search of specimens for the formation of series showing the evolution of the horse, the cost of which was met by Mr. William C. Whitney; the Andrew J. Stone expedition to the Northwest for the purpose of obtaining specimens of the large game animals of the continent; expeditions from the Department of Vertebrate Palæontology to Wyoming, Colorado and other parts of the West for fossil

THE AMERICAN MUSEUM JOURNAL

reptiles and mammals; an expedition to the Selkirks for birds; one to South Dakota and Wyoming for fossil invertebrates, and one to the Black Mountains of North Carolina for insects.

Among the notable acquisitions received during the year there may be mentioned a unique and valuable collection of gold coins to the number of eight hundred from the Philadelphia mint, presented by Mr. J. Pierpont Morgan; the Briggs collection of Indian basketry, presented by Mr. George Foster Peabody; a series of Ainu objects made by Prof. Bashford Dean, and presented by Mr. Arthur Curtiss James; a large collection of shells donated by Mr. Frederick A. Constable; large additions to the Hoffman collection of Butterflies by the Very Rev. Eugene A. Hoffman; the Sennett collection of eight thousand birds; the Dorenburg collection of Mexican antiquities, and a large collection of Indian objects.

The scientific staff of the Museum has been active along the line of publication, having issued during the year six parts of the quarto Memoirs, Part IV (conclusion) of Volume XI, Volume XIV and Part I of Volume XV of the Bulletin and eight numbers of the American Museum Journal. Four of the Memoirs emanated from the Anthropological Department, one from the Entomological Department and one from the Department of Vertebrate Palæontology.

Mr. Morris K. Jesup was elected President for the twenty-second term; Mr. Wm. E. Dodge and Professor Henry Fairfield Osborn were re-elected First and Second Vice-Presidents, respectively; Mr. Charles Lanier was re-elected Treasurer, and Professor Hermon C. Bumpus was made Director.

A FOSSIL ARMADILLO FROM TEXAS.



ONE of the most valuable and interesting finds made by the American Museum Texas expedition of 1901 was that of a nearly complete carapace, or shell, the tail-pieces and part of the internal skeleton of a Glyptodont. The specimen was found by the writer in the side of a bluff of "Bad Lands" at Mount

THE AMERICAN MUSEUM JOURNAL

Blanco, Texas. The only portions visible at first were a few small pieces of the scutes or scales that had been washed away and lay uncovered at the bottom of the little ravine, below where the main part of the skeleton still reposed in its original bed or matrix, but so completely hidden by the loose material and bunches of grass that covered the hill-side that it was only by diligent search that it was discovered.

This queer animal belonged to a family of Edentates allied to the living armadillos. It was, however, much larger than the armadillo and differed from that animal in having a perfectly rigid armor or shell. The armadillo has the plates of its armor fastened together in certain places in a manner to make them slightly movable one upon the other, enabling the animal to curl up in his shell, somewhat after the manner of a porcupine. The carapace of this Glyptodont from Texas is about four feet long, and the tail-piece is about two and one-half feet in length, hence the total length of the animal in life, from the point of the nose to the tip of the tail, must have been between seven and seven and one-half feet.

This unique specimen is of particular scientific interest, since it is the first one of this extinct family, sufficiently well preserved to show any of its characters, found so far north in this country. Remains of species of Glyptodonts are very abundant in South America.

J. W. GIDLEY.

THE INTERNATIONAL CONGRESS OF AMERICANISTS.



THE twelfth International Congress of Americanists held in connection with the Universal Exposition at Paris in 1900, it was voted to accept the invitation of Mr. Morris K. Jesup to hold the thirteenth congress of the association in the halls of the American Museum from the 20th to the 25th of October next. Last November, Mr. Jesup, as president of the commission of organization of the meeting, issued an invitation to all the Americanists in the world to join the congress, the object of the

THE AMERICAN MUSEUM JOURNAL

convention being, in the words of the circular of invitation, "to bring together students of the archæology, ethnology and early history of the two Americas, and by the reading of papers and by discussions to advance knowledge of these subjects."

The subjects to be discussed by the Congress relate to—

- I. The Native Races of America: their Origin, Distribution, History, Physical Characteristics, Languages, Inventions, Customs and Religions.
- II. The History of the Early Contact between America and the Old World.

To make the preliminary arrangements for the congress and the discussions pertaining to the foregoing topics, President Jesup appointed a special committee, consisting of the heads of the departments of Anthropology in the American Museum, and invited the American Association for the Advancement of Science through its section of Anthropology to advise and coöperate with that committee in selecting a general commission of organization, representative of the leading institutions in the United States at which work in Anthropology is being done.

The officers of the Commission of Organization are as follows: President, Morris K. Jesup; Vice-President, The Duke of Loubat; General Secretary, M. H. Saville; Treasurer, Harlan I. Smith.

The list of the members of the General Commission and the institutions which they represent is: Franz Boas, Columbia University; E. G. Bourne, Yale University; Charles P. Bowditch, American Antiquarian Society; John C. Branner, Leland Stanford Junior University; J. V. Brower, Minnesota Historical Society; H. C. Bumpus, American Museum of Natural History; Sydney H. Carney, Jr., New York Historical Society; A. F. Chamberlain, Clark University; T. F. Crane, Cornell University; Stewart Culin, University of Pennsylvania, American Philosophical Society and Numismatic and Antiquarian Society of Philadelphia; George A. Dorsey, Field Columbian Museum; G. T. Emmons, U. S. Navy; Livingston Farrand, New York Academy of Sciences; J. Walter Fewkes, American Association for the Ad-

THE AMERICAN MUSEUM JOURNAL

vancement of Science; Geo. P. Garrison, Texas State Historical Association; D. C. Gilman, Johns Hopkins University; Charles S. Gleed, Kansas State Historical Society; Stansbury Hagar, Brooklyn Institute of Arts and Sciences; Henry W. Haynes, American Academy of Arts and Sciences and Massachusetts Historical Society; F. W. Hodge, Smithsonian Institution; Levi Holbrook, American Geographical Society; W. J. Holland, Carnegie Museum; W. H. Holmes, U. S. National Museum; A. L. Kroeber, University of California; Otis T. Mason, Columbian University; W. J. McGee, National Geographic Society; Clarence B. Moore, Academy of Natural Sciences of Philadelphia; Edward S. Morse, National Academy of Sciences; W. W. Newell, American Folk-Lore Society; A. S. Packard, Brown University; G. H. Perkins, University of Vermont; J. W. Powell, Bureau of American Ethnology; F. W. Putnam, Harvard University; William B. Scott, Princeton University; Frederick Starr, University of Chicago; J. J. Stevenson, New York University; R. G. Thwaites, State Historical Society of Wisconsin; John Williams White, Archæological Institute of America; Jas. Grant Wilson, American Ethnological Society; Thomas Wilson, Anthropological Society of Washington; Talcott Williams, American Historical Association.

Since the Congress of Americanists has never before met in this country, a brief statement relating to its history and its objects will be of interest in this connection. For several years prior to 1857 there were several gentlemen living in France who were especially interested in the pre-Columbian history of North and South America, particularly in relation to the ancient civilizations of Mexico and Peru and the theories regarding the peopling of the New World. In order further to encourage research on these and kindred subjects pertaining to America, a society was organized in that year under the name, "La Société Américaine de France."

This association flourished to such a degree that its members conceived the idea of assembling an International Congress of Americanists to meet in Nancy, France, in 1875. The meeting at Nancy was attended by representatives of various countries,

THE AMERICAN MUSEUM JOURNAL

and statutes were adopted which established the broader organization on a firm basis. Biennial meetings were held at first, and the place was selected by the council of the "Société Américaine de France"; later, the place and time of the meeting were determined by the Council of the Congress. Sessions of the Congress have been held at irregular intervals, first at Nancy, then at Luxemburg, Brussels, Madrid, Copenhagen, Turin, Berlin, Paris, Huelva, Stockholm, Mexico and again at Paris in 1900.

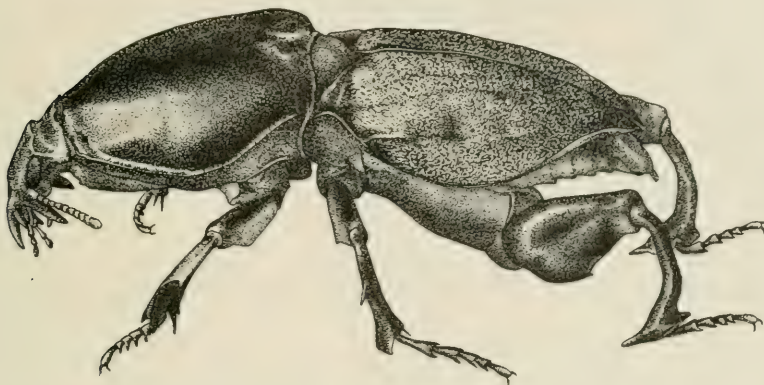
In acknowledgment of the international character and importance of these gatherings of students of ancient American history, the Congress has in several instances been directly under royal patronage, and everywhere great consideration has been accorded to the members, and high honor bestowed upon the Congress. The Presidents of the Congress have been men distinguished for their work in some of its sections. A volume is published after each meeting containing a résumé of the proceedings of the Congress and a number of the important papers read at the meeting.

With a full appreciation of all that the meeting of the Congress implies, the American Museum of Natural History will strive to do its part, as host, to make the coming meeting a successful one. The great collections in American archæology and ethnology, and the opportunities for comparative study which the Museum offers, with its corps of workers to give assistance, should induce many foreign Americanists to visit this continent, which is the field of their investigations, while to all who come, whether from this country or abroad, a most hearty welcome will be extended.

LAST month the Department of Vertebrate Palæontology placed on exhibition in its hall a remarkable specimen of an extinct Dog from Skillet Cik Donley Co., Texas, which has been described by Dr. W. D. Matthew under the name *Dinocyon Gidleyi*. The animal is the largest of the dog family thus far described and belongs to an extinct race resembling in many respects the bears. It must have equalled or exceeded the polar bear in size. The specimen consists of the skull with a con-

THE AMERICAN MUSEUM JOURNAL

siderable part of the spinal column attached and parts of two bones of the leg. It may be found in Case 8 on the north side of the hall. A restoration of the head of the animal has been made in water colors by Mr. Charles R. Knight and is exhibited in connection with the specimen.



HYPOCEPHALUS ARMATUS DESMAREST.



SPECIMEN of the remarkable Beetle, *Hypocephalus armatus* Desmarest, has been purchased recently by the Museum and has been placed on exhibition in the gallery of the East Wing (Hall No. 302).

The creature is a native of Brazil, where it lives in the roots of one of the plants of the tropical forest, probably confining itself to one kind of plant. The species has given rise to considerable controversy among scientists, and there have been more divergent opinions expressed regarding its systematic position and relationships than those of any other form of beetles known. In form and structure it is very different from any other member of the order Coleoptera, though its general external appearance is somewhat like that of the mole-cricket (*Gryllotalpa*). Without going deeply into anatomical details, the principal features which characterize this creature are the large prothorax, which equals in length and bulk the hinder portion of the body; the five-jointed tarsi; the enormously developed hind femora; the form of the mandibles; the manner in which the head is

THE AMERICAN MUSEUM JOURNAL

joined to the thorax; the short antennæ, and the legs, which are adapted to digging. This insect was first described in 1832 by Desmarest, and it has been generally conceded by entomologists that it forms a distinct genus and even family of Coleoptera. The species is considered to be a remnant or fragment of a very old fauna, otherwise unrepresented among living forms. The illustration given herewith is about six-fifths natural size.

W. BEUTENMÜLLER.

LECTURES IN MARCH AND APRIL.

THE City Board of Education has provided the following courses of illustrated lectures for March and April. Saturday evenings, on physical geography:

March 1.—JACQUES W. REDWAY, "Life of a World." An explanation of some important facts in geology.

March 8.—JACQUES W. REDWAY, "Industrial Regions of the United States."

March 15.—RICHARD E. DODGE, "Man's Relation to Rivers and River Valleys."

March 22.—RICHARD E. DODGE, "Man's Relation to Mountains and Plains."

March 29.—RICHARD E. DODGE, "Life in the Deserts."

April 5.—CYRUS C. ADAMS, "Great Ports of the World."

April 12.—JOHN W. MOYER, "How to Know the Common Trees."

April 19.—JOHN W. MOYER, "Where Lumber Comes From."

April 26.—MISS LOUISE KLEIN MILLER, "Home Gardening."

Tuesday evenings, on the geography of North America:

March 4.—JOHN P. CLUM, "Alaska."

March 11.—S. T. WILLIS, "The Mississippi Valley and the Southern States."

March 18.—H. L. BRIDGMAN, "Seeking Peary and the Pole."

March 25.—W. E. MEEHAN, "Pennsylvania."

April 1.—EGERTON R. YOUNG, "In the Land of the Red Men, as they Were and Are. With Glimpses of Prairies, Mountains, Lakes and the Glorious Northern Auroras."

April 8.—W. E. MEEHAN, "Florida."

April 15.—JOHN P. CLUM, "In the Wake of the Setting Sun."

April 22.—W. E. SIMMONS, "The Nicaragua Canal."

April 29.—JOHN C. BOWKER, "Hawaii."

The doors of the lecture hall will be opened at half-past seven, and the lectures will begin promptly at eight o'clock.





Photo. by E. F. Keller

ELK OR WAPITI. NEW YORK ZOOLOGICAL PARK
(From negative taken for Department of Public Instruction, American Museum)

NORTH AMERICAN RUMINANTS.

By J. A. ALLEN, Ph.D.,

Curator, Department of Mammalogy and Ornithology.

INTRODUCTION.

THE Ruminants of North America comprise the Deer, the Pronghorn Antelopes, the Bighorn or Mountain Sheep, the Mountain Goats and the Bison or "Buffalo." They are all "game animals," and, like the game animals of all parts of the world, they are, in many instances, rapidly approaching extermination. The Bison, once so abundant on our western plains, is now almost an animal of the past. The Elk or Wapiti Deer has been exterminated over probably nine-tenths of its former range; the Pronghorn, the Virginia Deer and the Mule Deer have also become greatly restricted, as has the Moose. Even the Caribou and the Musk-Ox in the far North are being slaughtered annually by the thousand, and are becoming exterminated over extensive areas where they were formerly abundant.

The partial extermination of large mammals is inevitable, as the country becomes settled, and the land is required for agricultural purposes, but in this country the waste of animal life has been enormous and inexcusable. The Buffalo was slaughtered by the million long before its haunts were needed for settlement, partly for its hide and partly to afford sport for the big-game hunter. The slaughter of the Elk in the trans-Mississippian territory has been almost equally needless and extensive. The Rocky Mountain Bighorn has been wiped out of existence over large portions of its natural range, and now the destruction of the Caribou and Moose in the far North is proceeding with almost incredible rapidity, not only in the regions invaded by the miner and prospector, but also along the Arctic coast for the supply of whale ships with fresh meat. Doubtless some of the strongly marked climatic races of the Deer tribe have been wholly destroyed, with no specimens in our museums to testify to their former existence.

NORTH AMERICAN RUMINANTS

Owing to the large size of these animals and the consequent difficulty and expense of obtaining and preparing them, very few specimens have found their way to museums, and no time should be lost in obtaining such series as will adequately represent them, since it will soon be too late to secure the animals even for museum purposes. A single specimen or a pair of specimens is insufficient for the purpose, since each species varies greatly in color according to season and in other characters according to age and sex. Our large museums owe it to posterity to see that these animals are suitably represented, preferably mounted as groups with their natural surroundings, and in large series for the purposes of research and to draw upon later for exhibition, since it unfortunately happens that specimens exposed to light as museum exhibits quickly deteriorate by fading and from other causes, and eventually require replacement by fresh material.

HORNS AND ANTLERS OF RUMINANTS.

The Ruminants are herbivorous, cud-chewing animals; they include the Deer, the Pronghorns, the Antelopes, the Sheep, the Goats and the Ox tribe, and hence nearly all of the mammals most economically important to man. They form two quite distinct divisions according to the nature of their horns, these divisions being known respectively as Solid-horned Ruminants and Hollow-horned Ruminants, and also as Antlered Ruminants and Horned Ruminants. The first section includes the Deer and Pronghorns, and the other the Antelopes and the Sheep, Goat and Ox tribes. The antlers of Deer consist of nearly homogeneous

Antlers of Deer.

bony tissue, lighter and more porous in structure than ordinary bone; are generally much branched or forked, and are shed and renewed every year. They are secondary sexual organs, usually present only in the male, and when existing in the female, as in the case of the Caribou, they are greatly reduced in size. They are shed soon after the rutting season, and are renewed by a wholly new growth, acquired slowly, so that the fully grown and perfected antler is worn for only a few months. During growth it is enclosed in a soft membrane,

NORTH AMERICAN RUMINANTS

covered externally with short, thick, velvety fur, which consists of a network of blood vessels which supply nutriment for the growth of the antler. During this stage the antlers are said to be "in the velvet," and are then very sensitive to injury. When fully grown, the membranous covering shrivels and dries up, and falls off in shreds or is rubbed off by the animal.

The horns of the hollow-horned Ruminants are entirely different from the antlers of Deer, in structure as well as in manner of growth. They are usually common to both sexes, as Horns of
Oxen,
Sheep, etc. in our domestic cattle, are simple and not branched, and grow continuously throughout the life of the animal, though very slowly after it has reached maturity, and are never shed. They consist of a bony core—an elongated process from the frontal bone—covered with horn, from which the organ takes its name, and which is easily removed by maceration, or through decomposition after the death of the animal. This outer shell is the true horn, the bony core is its support.

The American Pronghorns offer a *quasi* exception to this division of Ruminants into solid-horned and hollow-horned sections. They have the permanent bony horn-core of the hollow-horned division, with an outer horny sheath, which is annually shed and renewed, as are the solid antlers of the Deer tribe. They are, however, usually assigned to the solid-horned or antlered section of Ruminants.

FAMILIES OF NORTH AMERICAN RUMINANTS.

Technically speaking, the Ruminant game animals of North America consist of three distinct families, two of which are represented by several genera, and some of the genera by numerous species. These families are, the Pronghorns, family *Antilocapridæ*; the Deer, family *Cervidæ*, and the Sheep, Goat and Ox tribes, forming the family *Bovidæ*. These will be now passed in review, with special reference to their present representation in the American Museum. The geographical area covered in this connection by the term North America includes the whole North American continent from the Arctic regions to Panama.



Photo. by E. F. Keller

PRONGHORN OR AMERICAN ANTELOPE. NEW YORK ZOÖLOGICAL PARK
(From negative taken for Department of Public Instruction, American Museum)

NORTH AMERICAN RUMINANTS

ANTLERED RUMINANTS.

The Pronghorns, or Pronghorn Antelopes, or American Antelopes, as they frequently are called, formerly had a range which extended from the Saskatchewan region southward over the plains, parks and portions of the Great Basin Pronghorn. region to the tablelands of Mexico, their eastern limit being the eastern border of the Great Plains. Over this vast area they formerly ranged in large herds, numbering hundreds and often thousands of individuals, but they have now disappeared entirely from a large portion of this great region, being found in their former abundance only within comparatively limited districts. Two forms of Pronghorn are now recognized by naturalists—a northern and a southern, the latter at present confined to a small area in Mexico. The Pronghorn, though often called the “American Antelope,” is not a true Antelope, as once supposed, but is a distinct family type, found only in North America. It is one of the most beautiful, graceful and agile of American game animals, gentle, and possessed of great curiosity, advantage of which is often taken to secure its destruction. Unless strenuously protected, it will soon wholly disappear from our western mountain valleys and plains.

The Pronghorn is represented in the Museum by a pair of mounted specimens and a mounted skeleton, and in the study collection by a small series of skins and skulls. Owing to the peculiar interest of this very distinct type, it should be elaborately presented to the public as a group, with the proper setting to illustrate its natural haunts.

The Deer tribe consists of five groups, commonly recognized as genera, namely: the Elk, genus *Cervus*; the small Deer of the United States and Mexico, genus *Dama* (recently North known, successively, as *Cariacus*, *Dorcelaphus* and American *Odocoileus*); a smaller kind of Deer or Brocket, with Deer. unbranched antlers, of the genus *Mazama*, found only in Central America; the Moose, genus *Alces*, with broad palmate antlers, and the Caribou, genus *Rangifer*, of which four or five very distinct forms are known.



ELK OR WAPITI, NORTH DAKOTA
(From Bulletin American Museum, Vol. XVI, 1902, p. 5)



ARIZONA ELK

(From Bulletin American Museum, Vol. XVI, 1902, p. 4)

NORTH AMERICAN RUMINANTS

The Elk, or Wapiti Deer, is one of the largest and most stately of the Deer tribe, with very large, branching antlers and a magnificent pose. This animal formerly ranged eastward nearly or quite to the Atlantic coast of the Middle States, but now it practically is extinct east of the Rocky Mountains and is becoming greatly reduced in numbers throughout the western natural parks and valleys, where not many years ago it roamed in large bands. This type of Deer formerly extended southward to the northern border of Mexico, occupying isolated areas wherever the conditions of the country favored its existence. The eastern form probably differed considerably from the animal of the plains and Rocky Mountain region, but how and to what extent it was distinct will never be determined, owing to the entire absence from our museums of specimens from the eastern part of the United States.

A darker western form, known as the Roosevelt Elk, is still found in small numbers in the coast ranges of Oregon, Washington and British Columbia. It is much darker in color, and differs somewhat in the character of the antlers from the Rocky Mountain form. A southern form, almost extinct, has been described recently from Arizona, which differs from the others in color and in the form of the antlers. Of the Rocky Mountain Wapiti, the Museum has several poor mounted specimens, a mounted skeleton and several specimens in the study collection, mostly animals which had been in captivity and which have been received from zoölogical gardens. Of the Roosevelt Elk, the Museum recently has purchased a series of five specimens for mounting as a group, but the Arizona form is represented by a single skull. It is very desirable that the mounted specimens should be replaced by better examples, and the Arizona Elk obtained, if possible.

The Moose, perhaps the largest of the Deer tribe, being heavier bodied than the Elk, but with less branching though much broader antlers, is found from northern New England, northern Minnesota and Montana northward nearly to the Arctic regions. The Moose of the eastern districts is already represented in the Museum by a group of specimens, ob-

NORTH AMERICAN RUMINANTS

tained mostly in New Brunswick and mounted with great care and proper setting, the accessories representing an autumn scene in the actual haunts of the animal. This group, the most elaborate of its kind in the world, and the method of its construction



ALASKA MOOSE (*ALCES GIGAS*)

From mounted specimen in Museum. Andrew J. Stone Expedition

will be described at length in a subsequent supplement to the JOURNAL. The Moose found in Alaska differs from the eastern Moose in its somewhat larger size, darker coloration and more massive antlers. It has been called *Alces gigas*, in reference to



NEWFOUNDLAND CARIBOU (*RANGIFER TERRÆNOVÆ*)
Mounted specimen in American Museum
(From Bulletin American Museum, Vol. VIII, 1896, pl. x)



KENAI CARIBOU (RANGIFER STONEI)

Mounted specimen in American Museum. Andrew J. Stone Expedition

(From Bulletin American Museum, Vol. XIV, 1901, p. 144)

NORTH AMERICAN RUMINANTS

its large size. The largest antlers have the remarkable spread of seventy-eight inches. The Museum is fortunate in the possession of a good series of this type of Moose, suitable for mounting as a group or as single specimens. For this valuable material we are indebted to the Andrew J. Stone expedition, for the maintenance of which the necessary funds have been generously contributed by friends of the Museum.

The Caribou are even more boreal than the Moose. They range next in size to it and the Elk, and have graceful, slender, profusely branching antlers. They are found from
Caribou. northern New England and British Columbia northward to the Arctic coast, and they occur also in Greenland. While the different varieties present general similarity, they differ greatly in size and in style of antlers, according to the regions they inhabit. The Newfoundland Caribou is an insular form restricted to the island from which it has received its name. It is characterized by short, heavy, much-branched antlers and very light coloration. Of this species the Museum has several mounted specimens, but it is especially desirable that it should be illustrated by a group.

The Woodland Caribou, as its name implies, inhabits the woodlands of the colder parts of eastern North America. It is a large dark form, with rather stout antlers. The Green-
Woodland Caribou. land and Barren Ground Caribou are both small forms, with relatively long but very slender antlers. They are of special interest as representing the most northern type of the Deer tribe, their homes being the treeless Arctic tundra. Neither form is at present well represented in the collection.

The Mountain Caribou is found in the Rocky mountains from British Columbia northward; it is represented in the mounted
Mountain Caribou. collection by a fine adult male. It is one of the largest members of the group, of very dark color and with massive antlers. In Alaska, there appear to be two other phases of this plastic group, one very large and the other small, with small, rather delicately formed antlers. This latter form is now represented by a good series of specimens, just

NORTH AMERICAN RUMINANTS

received from the Stone expedition, which will be mounted in a group as soon as the means for its construction have been provided.

The Deer constituting the genus *Dama* are much smaller and more graceful and are more delicately formed than the Caribou and Moose. They are typically represented by the common eastern or Virginia Deer, and are very numerous in species and subspecies, many of which are quite restricted in distribution. Those of the United States fall into three groups, commonly known as White-tailed Deer, Mule Deer and Black-tailed Deer. The White-tailed Deer embrace the Virginia Deer and its related subspecies, of which four or five are now currently recognized, which differ from one another in size and in minor details of coloration. The Deer, like many other animals, decrease notably in general size, and in the size of the antlers, from the north southward, and are thus separable into well-marked races; the Florida Deer, for example, being not much more than half as heavy as the Deer found in Maine and New Brunswick. Another form of the group is found on the plains, another in Texas and still another in Louisiana.

Virginia
Deer.

The Mule Deer, so called from the large size of the ears, occupy the middle region of the continent from Canada to Mexico, but are typically represented by the form found in the Dakotas. There are other subspecies in Manitoba, California, Sonora, Mexico and the islands off the coast of California.

Mule Deer.

The Black-tailed Deer, found only on the Pacific slope from California northward to Sitka, are represented by a series of forms. On comparing specimens from Sitka with those from Southern California, the differences in size and color are very striking.

Black-
tailed Deer.

Besides the Deer already mentioned, five species of this genus are found in Mexico. In comparison with the Virginia Deer they are exceedingly small, with the antlers greatly diminished, being, in fact, miniature representatives of the more northern forms of the genus. In Costa Rica there is another type of small Deer, in which the antlers are

Mexican
Deer.

NORTH AMERICAN RUMINANTS

reduced to a single tine only a few inches in length. This Deer belongs to a South American group of the genus *Mazama*, not otherwise represented north of the Isthmus of Panama.



VIRGINIA DEER

From the group in Local Collection, American Museum

In brief, there are between twenty-five and thirty species of small Deer found in North America, including Mexico, of which

NORTH AMERICAN RUMINANTS

only six are represented in the Museum. Of these the eastern or Virginia Deer is exhibited in a group in the Local Collection, and there are two or three other mounted specimens in the North American collection. The five other species are represented by single specimens, several of them very poorly mounted; consequently, it may be said that, comparatively speaking, the Museum is

Number of
Deer in
North
America.



Photo, by E. F. Keller

MEXICAN DEER. NEW YORK ZOÖLOGICAL PARK

(From negative taken for Department of Public Instruction, American Museum)

almost destitute of the Deer of this extensive group, only a small part even of those found in the United States being shown in the exhibition series.

NORTH AMERICAN RUMINANTS

The Deer are subject to much greater variations due to season than most other large mammals, and vary also greatly with age.

Variations in Deer due to Season. The young of the Elk and of all the smaller Deer are, at first, bay spotted with white. After a few months they change their dress for one of a more uniform and wholly different tint, while the adults have a summer dress very different from that worn in winter. The summer coat is short and comparatively fine in texture and generally is of some shade of yellowish brown or "fawn color." At the approach of winter this is succeeded by new hair of a bluish cast, which later becomes brownish gray through the addition of the long, coarser hair that forms the winter coat. The exact tint varies with the species, but the fall and winter coats are always very different in general effect from the dress of summer. The summer coat is commonly termed, in hunter's parlance, the "red coat" and the fall dress the "blue coat."

Besides the differences due to a change of coat with the change of the seasons, there are other differences due to age, as in the size and shape of the antlers, their absence in the females at all seasons, and their presence in the males during a portion of the year, and the very different appearance of the antlers when "in the velvet" and when mature. The Deer thus afford very effective material for Museum exhibits, and quite a series of specimens of the same species is required for its proper illustration. Such series, mounted in groups, with proper settings to show the nature of the diverse haunts characteristic of the different species, afford ample range for the skill of the taxidermist and abundant means for the presentation of attractive museum exhibits, pleasing and instructive to the visitor, and form permanent records of species rapidly passing out of existence.

HORNED RUMINANTS.

Having now passed in review the Deer tribe, we reach the Sheep and Ox tribes. Most prominent of these is the almost extinct American Bison, fortunately well represented in the



Emory M. Smith, 1900

AMERICAN BISON
Group in American Museum of Natural History

NORTH AMERICAN RUMINANTS

Museum by skeletons, skulls and skins, in addition to the fine group which forms so conspicuous an exhibit in the North American Hall. Indeed, the Museum is to be congratulated on having not only the finest Bison group in the world, but a large reserve stock of specimens of this rapidly disappearing type, which but a short time ago existed in seemingly

American
Bison.



AMERICAN BISON

Cow and calf from group in American Museum
Specimens presented by Col. W. F. Cody

inexhaustible numbers. In the summer of 1871 the author saw on the plains of western Kansas Buffaloes by the hundred thousand, if not by the million. As far as the eye could reach, the plains, on certain occasions, were literally black with Buffaloes.

NORTH AMERICAN RUMINANTS

The hide hunters were already among them, and this was one of the years of their greatest havoc. Three years later these same plains were covered with the bleaching carcasses of these hundreds



STONE MOUNTAIN-SHEEP (OVIS STONEI)

Mounted specimen in American Museum

(From Bulletin American Museum, Vol. IX, 1897, pl. ii)

of thousands of Bisons, from which merely the hides had been removed and the bodies left to rot. In 1873 similar scenes were witnessed in the valley of the Yellowstone, and here again, a few years later, only the carcasses of dead Buffaloes remained,



FIG. 1



FIG. 2

FIG. 1. STONE MOUNTAIN-SHEEP. FIG. 2. ROCKY MOUNTAIN BIGHORN
From mounted specimens in American Museum
(From Bulletin American Museum, Vol. IX, 1897, pl. iii)

NORTH AMERICAN RUMINANTS

together with their well-worn trails, to testify to the former existence of the immense herds seen in 1873. And now, when only a few hundred remain of all the former millions that roamed the central portion of the continent, from Great Slave Lake to Texas, Congress is reported to be considering a bill for the protection of the American Bison!

The Mountain-Sheep or Bighorns number five species, only one of which is at present well represented in the exhibition collection. This is the Stone Mountain-Sheep from northern British Columbia. Through the Stone Expedition, however, there has just been secured a fine series of the Dall Mountain-Sheep of Alaska, which will furnish material for the illustration of this interesting species by an elaborate group. These two species show the extremes of color in the different kinds of our Bighorns, the Stone Sheep being nearly black and the Dall Sheep, almost pure white. Of the Rocky Mountain Bighorn, the longest known and largest of any of the North American members of the genus *Ovis*, the Museum possesses only a pair of poorly mounted specimens. Efforts have been made and plans elaborated for the construction of a group of this striking species, but the expense of the undertaking has thus far compelled the Museum authorities to postpone any attempt to prepare it.

The southern or Nelson Bighorn, recently described from the Grapevine mountains on the California-Nevada boundary, and the Mexican Bighorn, lately made known from the State of Chihuahua, Mexico, are still desiderata. But the Museum has been fortunate enough to secure an adult of the Fannin Mountain Sheep, discovered the past year near Dawson, Northwest Territory, and known as yet from very few specimens.

The Rocky Mountain Goats comprise two species, one of which has been discovered only recently in the Copper River region of Alaska, and very few specimens of it have as yet reached any museum. The Mountain Goat of the northern United States and British Columbia is represented in our exhibition collection by a single specimen. A group of this species has long been planned, and a few specimens



BARREN GROUND MUSK-OX. ADULT MALE

Mounted specimen in American Museum
(From Bulletin American Museum, Vol. XIV, 1901, pl. xii)

NORTH AMERICAN RUMINANTS

have been gathered for it, but not enough to complete the group. The Goats and Sheep are mountain dwellers, and their favorite haunts are the more inaccessible parts of the higher ranges. Yet they have been followed by the hunter into their remotest and most secluded resorts. The Sheep are exceedingly watchful and sagacious, and these traits alone have preserved them from total annihilation. They have been exterminated in the more accessible parts of their ranges, and survive in comparatively small numbers and greatly restricted areas. The Goats were originally much less widely distributed in North America than the Sheep. Their chief protection lies in the inaccessibility of their favorite ranges; since, when once discovered, their safety depends upon the difficulty and danger attending their pursuit rather than upon that keen alertness so characteristic of the Mountain Sheep.

The Musk-Oxen, or Musk-Sheep, as they sometimes are called, are the only remaining members of the Ruminants to be mentioned. They are, however, neither oxen nor sheep, nor very closely allied to either, but are a very distinct **Musk-Oxen.** type of the hollow-horned section of the Ruminants, entitled to a distinctive name free from the implication of any such alliance. Like the misapplied name Buffalo for the Bison, however, and of Robin for various birds, in different countries, that are not robins, and scores of other misapplied popular names, the term Musk-Ox has so firm a foothold that it is not likely soon to be displaced. The Musk-Oxen are the most exclusively Arctic of all Ruminants, their home being the remote, treeless Barren Grounds of the far North, where vegetation is scanty, and the ground is buried in snow for a large part of the year. Nature has provided the animal with a heavy fleece of soft hair and wool for its protection against the inclemency of the long Arctic winter. The Musk-Oxen are in the last stages of numerical decline; formerly ranging, in comparatively recent geological times, as far south as Kentucky, Missouri and Utah, and over a large part of Siberia to Germany and England, they now are restricted to the Barren Grounds east of the Mackenzie river, the Arctic islands north of Hudson Bay, and a narrow coast strip on both sides of northern Greenland,



PEARY MUSK-OX. ADULT MALE
Mounted specimen in American Museum. Peary Expedition
(From Bulletin American Museum, Vol. XIV, 1901, pl. xiii)

NORTH AMERICAN RUMINANTS

where their numbers are being rapidly diminished by Indians and Eskimos and by Arctic explorers.

There are two species of Musk-Oxen, the Barren Ground and the Greenland, both of which are well represented in the Museum collection. Six specimens of the Greenland species, secured for the Museum by Lieut. R. E. Peary, have been mounted for a group and are ready for installation as soon as a suitable case can be provided. The Barren Ground species, also, is well represented by mounted specimens, including the young as well as the adult.

From the foregoing it is evident that the Museum is very deficient in the large game animals of North America, many of the forms being entirely absent and others very inadequately represented. It is the wish of the Museum authorities to exhibit each prominent species by a group, planned on a large scale, with proper accessories to illustrate the life habits of the animal; in other words, on the same scale as the present Moose and Bison groups in the North American Hall. The careful construction of these groups implies not only a considerable expenditure of money in procuring specimens of the animals for mounting, but also in furnishing the accessories and making the studies for its setting. The designer of a group should visit the country inhabited by the animals it is intended to illustrate, plan the group in the field, and collect samples of rock, soil and vegetation for use in the construction of the exhibit. In no other way can the results be realistic and satisfactory,—exact representations of nature, which it is the purpose of these groups to reproduce. Since not every specimen is suitable for mounting, a considerable series must be collected or purchased in order to select therefrom material that will be satisfactory.

Exhibits
Needed.

NOTE.—The attention of the reader is called to the fact that in the halls of Ethnology, Nos. 105 to 107, on the ground floor of the building, will be found many articles of dress made from the skins of the Deer and other members of the family of Ruminants, also many implements of the chase and of home industries made from the bones and antlers of the Deer, Elk etc. The teeth of some of the Rumi-



PEARY MUSK-OX. ADULT FEMALE
Mounted specimen American Museum, Peary Expedition
(From Bulletin American Museum, Vol. XIV, 1901, pl. xiv)

NORTH AMERICAN RUMINANTS

nants, particularly the so-called "tusks" of the Elk, have been used by the Indians for ornamental purposes. Specimens illustrating such uses will be found in the same halls. The Museum Memoir on the Thompson River Indians, by James Teit, contains descriptions of many such garments and implements, and the specimens therein described are on exhibition in these halls.

The ancestors of the higher Ruminants are mainly of Old-World origin and are comparatively scarce and late in appearance in the fossil beds of our own continent. The following exhibits in the Hall of Fossil Vertebrates, No. 402, on the fourth floor of the Museum, should be examined by the readers of this Guide Leaflet who are interested in evolution:

The Irish Deer, or Irish Elk, (*Megaceros hibernicus* Owen), from near Limerick, Ireland, a form which is related to the recent genus *Dama*. The specimen was presented to the Museum by Prof. Albert S. Bickmore.

A Model, one-fourth natural size, of *Cervalces*, the great Moose-Elk from the Pleistocene beds of New Jersey. The skeleton is in the Princeton museum.

A hind limb of a fossil Bison from the western Pleistocene beds of Nebraska.

The Department of Vertebrate Palæontology has, also, and soon will place on exhibition, the skull and other parts of a skeleton of *Cosoryx*, from the upper Miocene strata of Nebraska, an ancestor of the Pronghorn (*Antilocapra*), and a nearly complete skeleton of *Blastomeryx*, from beds of the same age in Colorado, an ancestral type of Deer more nearly related to *Odocoileus* than to any other, though its exact affinities have not yet been completely determined.—EDITOR.

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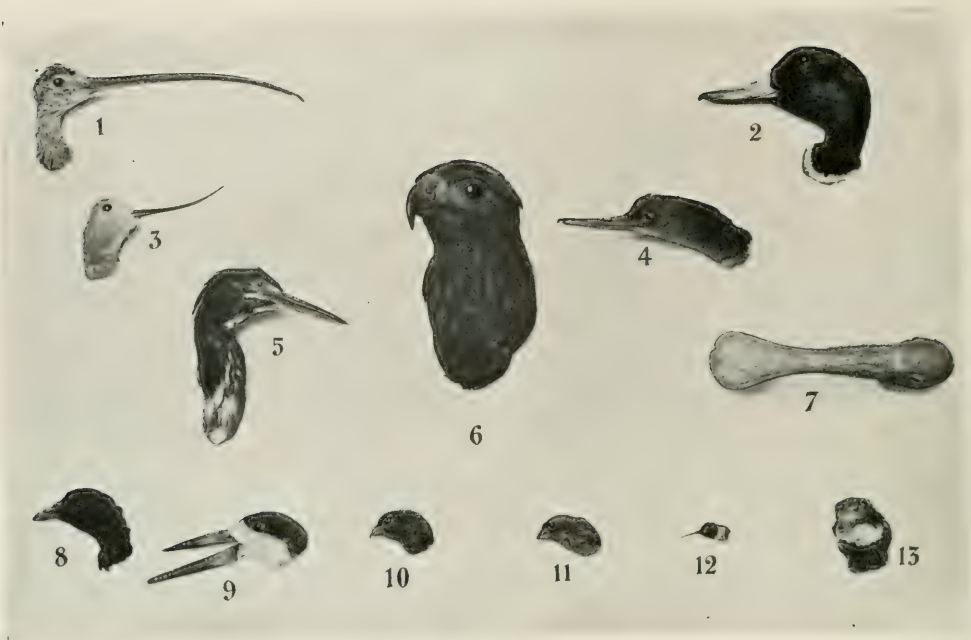
No. 4.



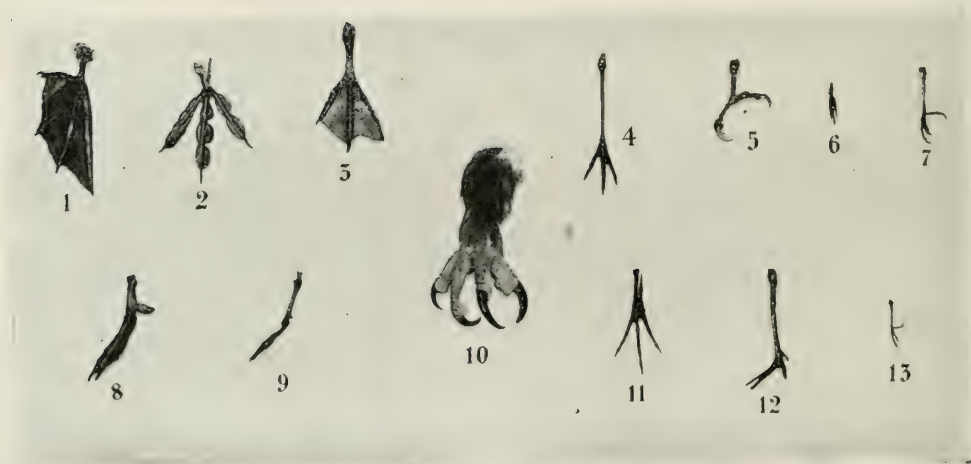
THE "Guide Leaflet" presented with this number of the JOURNAL is descriptive of a remarkable assemblage of baskets, sandals, pottery, clothing and articles of food, and the desiccated bodies of the people who made use of them, which has been installed in the southwest corner of the West hall, second floor. The people are known as the "Basket Makers" and they lived and died in the cañons of the southeastern part of Utah, probably before the prehistoric Cliff Dwellers inhabited that region. This collection comprises the oldest baskets known from this continent. Even as late as ten years ago it was not generally supposed that basket-making had been carried to such a high degree of perfection so early in the history of the American races.

DEPARTMENT OF PUBLIC INSTRUCTION.

JOHN C. MEDD, Esq., Hon. Secretary of the committee having in charge the Nature Study exhibition which is to be held in London next July, under the patronage of many well-known personages, among whom is Lord Strathcona, High Commissioner for Canada, has written to Prof. A. S. Bickmore, asking him to make an exhibit of the slides, photographs and methods used for "visual instruction" by the Department of Public Instruction of the American Museum. Mr. Medd, furthermore, has invited Prof. Bickmore to take part in the important series of conferences on Nature Study which are to be held in connection with the exhibition. Prof. Bickmore intends to accept this invitation and is making ready a series of photographic prints and slides illustrating the forestry of North America, as prepared for his lectures in the Museum and throughout the



TYPES OF BILL



TYPES OF FEET

TWO PARTS OF THE EXHIBIT DESIGNED TO ILLUSTRATE TERMS USED IN DESCRIPTIVE ORNITHOLOGY

THE AMERICAN MUSEUM JOURNAL

State. These photographs are in sets of six showing each forest tree barren of leaves and in full leaf, the trunk, a single leaf, the flower and the fruit. As far as is practicable, each set has been made from but one tree. The exhibit of the Department of Public Instruction will include, also, a complete series of photographs of the exhibition halls of the Museum, taken especially to show the study of our collections by classes of pupils from the free public schools. These series of photographs of trees have been especially commended by the national and State forestry authorities, who have requested the privilege of reproducing them in the illustration of their reports.

AN EXHIBIT DESIGNED TO ILLUSTRATE TERMS USED IN DESCRIPTIVE ORNITHOLOGY.



IN order to make the bird collection of greater value to students, there lately have been placed on exhibition several series showing birds' bills, feet, tails, wings and feathers, with the technical names which are applied to them by ornithologists. Thus, referring to figure 9 in the greatly reduced reproduction on page 32 of the exhibits showing "Types of Bills," the nature of a hypognathous bill is seen at once, and the technical name (Greek *ὑπό*, under, *γνάθος*, jaw) is found to relate to the fact that the under mandible is longer than the upper, a condition rare among birds. Again, turning to the plate of feet, it will be observed that a zygodactyle foot (Greek *ζυγόν*, a yoke, *δάκτυλος*, a digit) has two toes in front and two behind, hence the technical name, meaning, literally, yoke-toed.

These two illustrations are sufficient to show the practical use of this exhibit, but the thoughtful student will go a step further, and seeing, for instance, so many bills and feet brought into direct comparison with one another, will inquire, "Why this great variation in form?" This thought will lead to a study of the relation between habit and structure, one of the most interesting branches of the study of birds in nature. The hypognathous bill of the Black Skimmer, which in the dead specimen

THE AMERICAN MUSEUM JOURNAL

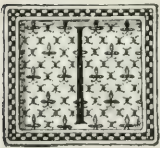
suggests a malformation, will then be found to be closely related to the bird's manner of feeding, which is to drop the elongated lower mandible slightly below the surface as it skims rapidly over the water. In this way the bird gathers various forms of aquatic life for food.

In a similar manner, observation shows that the singular, re-curved or upturned bill of the Avocet (No. 3) is used to find food on the bottom in shallow water. When feeding, the bird swings the head from side to side through an arc of about 50° , the convexity of the lower mandible just grazing the mud or sand, while the delicate, pointed tip of the bill is turned up out of harm's way. Similarly the lamellirostral or platy bill of the Mallard (No. 2), the serrate or saw bill of the Merganser (No. 4), the spatulate bill of the Spoonbill (No. 7), and the tenuirostral or slender needle-like bill of the Hummingbird, indeed the bills of all birds, will be found to be related to the character of the food of the bird in question or to the manner of obtaining it.

On studying the feet, wings and tails, a similar close connection between form and function is seen to exist; and, while it is necessary so to describe and name a form that the terms employed become a part of the exact language of science, terminology is only a means to an end, and should indicate to us the cause of the widely different types of structure which are encountered in nature and of which only a few are illustrated in this new exhibit.

F. M. C.

MEXICAN CODICES.



IN this JOURNAL for October, 1901, there is a brief notice of the exhibition of the reproductions of the several ancient Mexican manuscripts for which the Museum is indebted to the Duke of Loubat. To this interesting exhibit there has recently been added, as a gift from the Peabody Museum of Harvard University, a reproduction of a beautiful example of ancient Mexican picture-writing. The re-discovery of this codex is due to the indefatigable researches of Mrs. Zelia Nuttall, in whose honor it has been named the Codex Nuttall by the Peabody

THE AMERICAN MUSEUM JOURNAL

Museum, thus acknowledging the indebtedness of Americanists to this accomplished scholar and interpreter of ancient Mexican culture.

In the introductory pamphlet which accompanies this facsimile reproduction of the codex, Mrs. Nuttall shows that it was probably one of two native books sent by Cortes from Vera Cruz to Charles V in 1519. She also shows that the date corresponding to 1519 of the Julian calendar occurs in the Mexican pictographs, and is precisely that of the year that Cortes landed at Vera Cruz. In a discussion of the contents of the codex, Mrs. Nuttall states that "although beings of celestial descent are sometimes figured, it is obvious that the text deals with real persons and is mainly historical. Priests are represented wearing, as was customary, the insignia of some of the chief divinities, such as the rain-god, Tlaloc, or of Quetzalcoatl, yet the text is certainly not of a religious nature."

She follows out the history of "Lady Three-flint" and also of "Lord Eight-ehecatl, showing in this way the method, at least in part, of reading Mexican pictography, of which this codex is such a beautiful example. With the aid of Mrs. Nuttall's introductory pamphlet, students will be able to get a knowledge of Mexican picture-writing that has heretofore been hardly obtainable, and to the liberal patrons of American research who contributed to the publication of this valuable codex this Museum is, in common with others, greatly indebted.

Mrs. Nuttall designates the known Mexican codices as follows:

- I. Vatican Codex No. 3773.
- II. Borgian Codex.
- III. Bologna (Cospian) Codex.
- IV. F  j  vary (Mayer) Codex.
- V. Laud Codex.
- VI. Bodleian Codex.
- VII. Selden Codex.
- VIII. (a) Becker Codex; (b) Colombino Codex.
- IX. Vienna Codex.
- X. Codex Nuttall.

THE AMERICAN MUSEUM JOURNAL

Nearly all of these have now been reproduced, and are exhibited in the Mexican Hall of the Museum with other examples of Mexican pictography, including maps and mural paintings. In the case with the Mexican codices are also placed reproductions of the "Maya" or Central American codices showing the hieroglyphics of that region, which are also well represented on the monuments in the same hall.

F. W. P.

NEWS NOTES.

THE Museum has received considerable valuable material through the kind efforts of Professor Bashford Dean of Columbia University, who returned last fall from a year's sojourn in Japan. In addition to the Ainu material obtained by him and presented by Mr. A. C. James, to which reference was made in the January JOURNAL, Professor Dean selected and purchased for the Museum a beautiful collection of siliceous sponges comprising thirty-seven specimens which represent sixteen genera and about twenty-six species. In the series there are several remarkably fine examples of the "Venus flower basket."

DR. EDGAR A. MEARNS, Surgeon U. S. Army, to whom the Museum is already indebted for many thousand specimens, has recently donated to the Department of Conchology a large series of specimens illustrating the littoral molluscan fauna of the vicinity of Newport, Rhode Island.

THROUGH the generosity of Percy R. Pyne, Esq., the Museum was enabled in March to purchase two unpublished paintings of birds by John J. Audubon. The subjects of these paintings are the Myrtle Warbler and the Red-Eyed Vireo.

MUCH additional material from the A. J. Stone Expedition to Alaska has been received recently, among which there are specimens of what proves to be a fine new species of Caribou and a new species or subspecies of Mountain Sheep. This expedition is the first of a series made possible through the efforts of Madison Grant, Esq., and supported by him and other friends of the

THE AMERICAN MUSEUM JOURNAL

Museum, for the purpose of securing to the Museum an adequate representation of the game mammals of the continent. The past season's work has been especially important because it has provided the Museum with fine material from Alaska, a portion of America heretofore practically unrepresented in our collections.

THROUGH the kindness of Dr. William T. Hornaday, Director of the New York Zoological Park, the Museum receives many valuable specimens of mammals and birds in the flesh. The following have been sent in since the first of January:

MAMMALS.—1 Brazilian Deer, 1 young Axis Deer, 1 Newfoundland Caribou, 1 Elk, 1 Spanish Goat, 2 American Antelopes, 1 Canada Porcupine, 2 Otters, 1 Crab-eating Raccoon, 1 Kinkajou, 2 Marmosets, 1 Spider Monkey, 3 Entellus Monkeys, 3 Cebus Monkeys, 1 Macacus Monkey, 1 Cercopithecus Monkey, 1 Mongoose Lemur.

BIRDS.—1 Flamingo, 1 Eagle, 2 Peacocks, 1 Peacock Pheasant, 1 Stork.

MRS. C. P. HUNTINGTON and Archer M. Huntington, Esq., have provided liberally for the continuation of the work begun in 1899 by the Anthropological Department of the Museum among the Indians of California, through the liberality of Mr. Collis P. Huntington. Some of the results of the work already accomplished by the Huntington expedition among the California Indians have been published this winter in the Bulletin of the Museum by Dr. Roland B. Dixon. The "Basketry Designs of the Indians of Northern California" is the title of the first of the series of publications issued by this expedition.

ANOTHER instalment of Siberian material collected by the Jesup North Pacific expedition was received at the Museum in March. This consists of 135 boxes containing specimens illustrating the customs of the tribes living on the coast of the Sea of Okhotsk and on the Asiatic coast of Bering Sea. The collection was made by Messrs. Jochelson and Bogoras. The largest object is a great sea-going umiak or Eskimo skin-boat. Among other important specimens in this collection are some bits of ancient pottery from the north coast of the Sea of Okhotsk. At the

THE AMERICAN MUSEUM JOURNAL

present time no pottery is used by the tribes inhabiting the coast of Siberia north of the Amur river, while on the North Pacific coast of America, pottery occurs only among a few Eskimo tribes of Alaska. The occurrence of prehistoric pottery in northern Siberia seems, therefore, to be of particular archæological interest. The shipment contains also the large zoölogical collection made by Mr. N. G. Buxton, who accompanied the expedition.

DURING the first week in March Mr. C. E. Borchgrevink, the explorer who was in charge of the British Antarctic expedition, 1898-1900, and who spent a winter on the Antarctic continent, was the guest of the Museum. On March 7 he gave a highly interesting and instructive lecture in the Museum in which he described his travels and experiences in the extreme South. His lecture was illustrated by means of lantern slides, which gave a vivid idea of the difficulties and dangers met with and overcome by the explorer and his companions.

LECTURES.

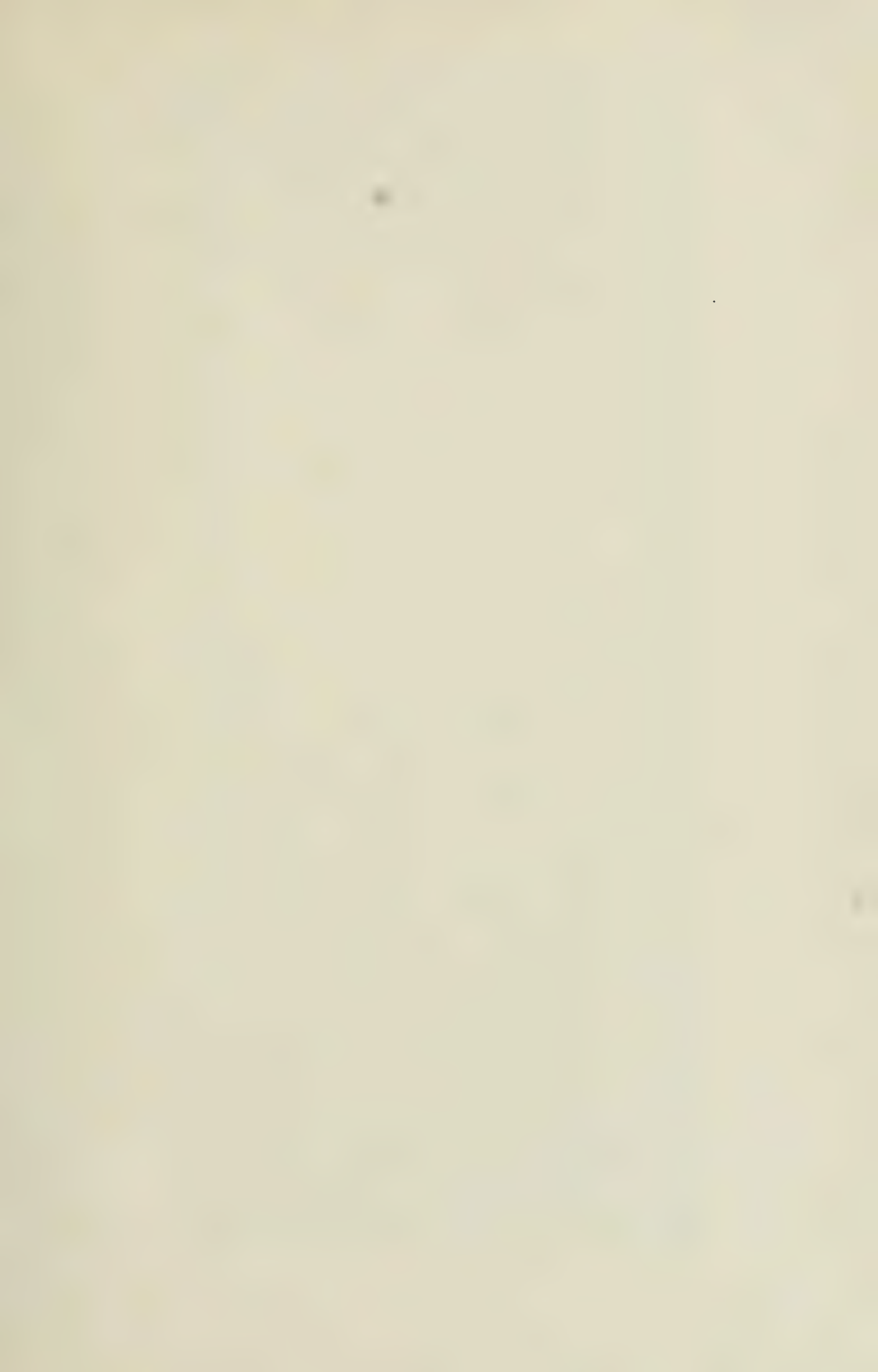
IN coöperation with the Audubon Society of the State of New York and the Linnæan Society of New York City the Museum has offered to teachers a series of eight informal talks on birds, illustrated by specimens which can be handled freely for purposes of comparison and discussion. The object of these lectures, which are given on Saturday afternoons at 3 o'clock during April and May, is to assist teachers in instructing their classes in this very important and interesting branch of Nature Study. The list of subjects and speakers is as follows:

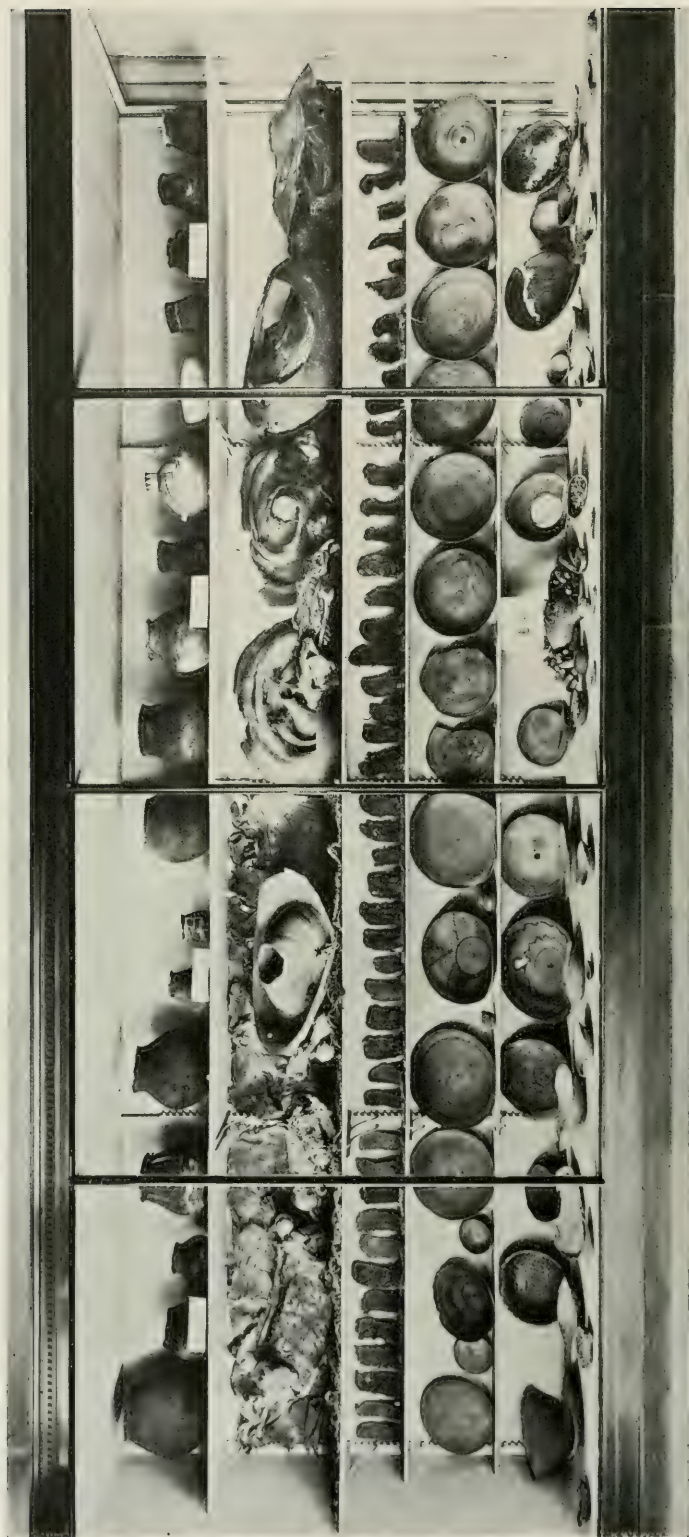
April 5 and 12.—“The Birds of Early Spring.” By FRANK M. CHAPMAN.

April 19 and 26.—“The Birds of April.” By WILLIAM DUTCHER.

May 3 and 10.—“The Birds of Early May.” By Dr. J. DWIGHT, JR.

May 17 and 24.—“The Birds of Late May, and Birds' Nests.” By C. WILLIAM BEEBE.





BASKETS AND OTHER OBJECTS FROM THE CAVES OF SOUTHEASTERN UTAH. HYDE EXPEDITION

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH.

BY GEORGE H. PEPPER,

Assistant in the Department of Anthropology.

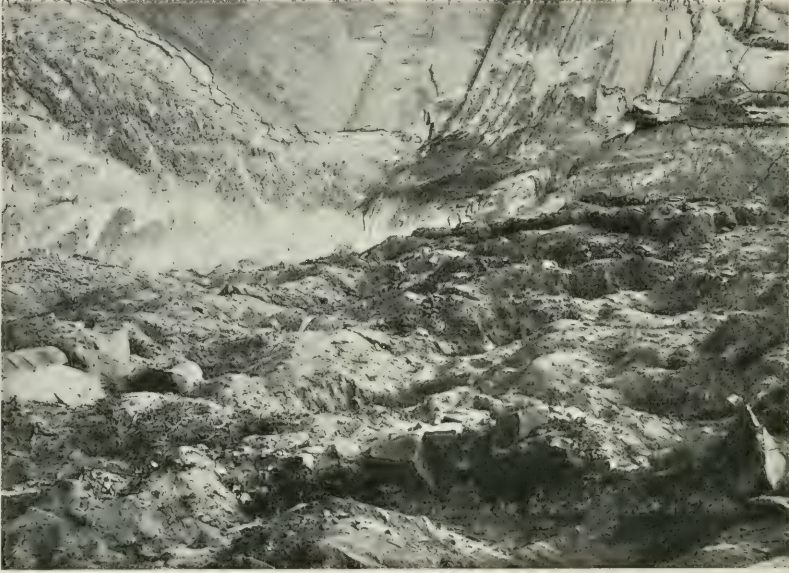
THE southwestern part of the United States is noted archæologically for its cliff dwellings and pueblos. The cliff-houses are more numerous in Colorado, Utah and Arizona, but the largest group of ruined pueblos is situated in one of the broad cañons of northwestern New Mexico. These homes of the ancient people, though differing greatly in form and situation, as well as the cave lodges and boulder houses of the old river beds, were doubtless the result of environment, and were probably, to a certain extent, occupied contemporaneously. The numerous problems suggested by these ruins have been studied by careful investigators, and exploration work has served to verify many hypothetical conclusions and to disprove as many more; but the work may continue indefinitely, for each season brings to light some new problems of importance, and it is one of these that will be considered in this paper.

The Wetherill family of Mancos, Colorado, have been closely associated with the archæology of the Southwest for nearly a quarter of a century, and they have had the honor of bringing before the public the great Cliff-Dweller region of Colorado and Utah. They have been untiring in their efforts as collectors and are keen observers. Richard, the eldest son, was the leader of most of the exploring trips, and it was he who found, in the Grand Gulch region of southeastern Utah, the skeletons of an ancient people, whose skulls were markedly different from those of the Cliff Dwellers, and who named this new people the "Basket Makers." Two gentlemen, Messrs McLoyd and Graham, followed the pioneers and made a representative collection of the objects and utensils of the Basket people. It is from accounts of the region given by the last named explorers, supplementing the statements of the Wetherill brothers, whom I consider

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

authorities on this subject, that I shall draw many of my facts.

Richard Wetherill, in writing of this region, says: "Grand Gulch drains nearly all the territory southwest of the Elk mountains, from the McComb Wash to the Clay Hills, about one thousand miles of territory. It is the most tortuous cañon in the whole of the Southwest, making bends from 200 to 600 yards apart, al-

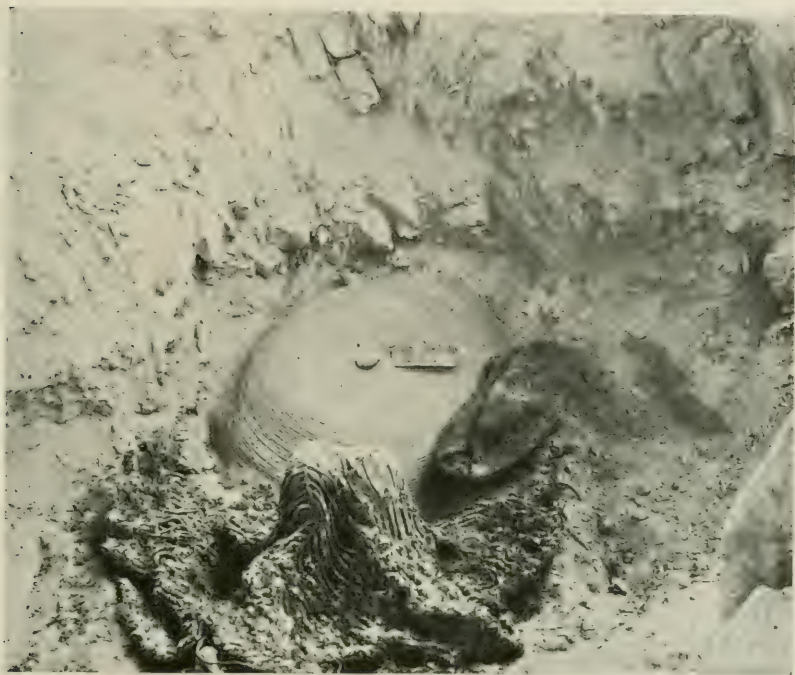


BURIAL CAVE OF BASKET MAKERS, GRAND GULCH, UTAH

most the entire length, or for fifty miles, and each bend means a **The Cañons** cave or overhanging cliff; all of those with an exposure of Utah. to the sun had been occupied either for cliff-houses or as burial places. The cañon is from 300 to 700 feet deep and in many places, toward the lower end, the bends are cut through by Nature, making natural bridges. Under these bridges, in some cases, are houses, and in such places are pictographs in the greatest profusion; the painted ones of the Basket Maker, with the later ones of the Cliff Dweller cut or incised in the rock without paying any attention to previous ones. Ingress and egress are very difficult, there being not more than five or six places where even

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

footmen can get into or out of the cañon. Water is fairly plentiful. Springs occur at very frequent intervals, running a short distance and sinking in the sand perhaps to rise again lower down the cañon. Wherever there are slopes a sparse growth of piñon and cedar occurs; about the springs are cottonwoods, willows and box-elders; in the shaded side cañons are mountain ash and



BASKET BURIAL, GRAND GULCH, UTAH

hackberry. The usual bush of the cañon is scrub oak. Canes or rushes cover the bottom lands in the vicinity of water."

This, then, was the home of the Basket Maker, at any rate, so far as we know. There are evidences that a few, at least, of these people found homes in the caves as far south as the Cañon de Chelle, but nine-tenths of the caves inhabited by these people have been found in the Grand Gulch country.

The Cliff Dwellers practiced artificial flattening of the head. This flattening was confined to the posterior portion of the

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

skull, and was as pronounced in the women as in the men. The occipital deformity is so noticeable and so constant among this people that a normal cranium among a lot of skulls would attract the attention of an investigator. Mr. Wetherill discovered that two forms of human skulls occurred in the cañons: the broad, short, flattened cranium of the Cliff Dweller and a narrow, elongate, normal cranium. The



BASKET BURIAL, GRAND GULCH, UTAH

latter was the only kind found buried under baskets, a fact which suggested to the discoverer the name "Basket Makers" as an appropriate appellation for the ancient people whose remains he had found.

But these were not the only marked differences between the two people whose remains are so closely associated. That the Basket Makers used the bow is doubtful. They had, however, a form of weapon unknown in the Southwest, either in ancient or

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

modern times, save in this restricted area,—the throwing-stick, whose nearest neighbor is found in Chihuahua, Mexico, in the form of the "atlatl," an implement of war concerning which wonderful tales were told by the early chroniclers of New Spain. There are other implements and utensils peculiar to this people, one of which is similar to the rabbit-stick used by the Hopi Indians of to-day; but the most striking features are the absence of houses in the caves and the manner of burying the dead. Weapons
and
Utensils.

The Basket Makers lived in caves, but the investigations in this region furnish no evidences of their having had stone houses. In some of the caves the houses of the Cliff Dwellers have been found over the remains of the earlier Basket Makers. Dwellings. In relation to the rooms excavated by the Basket Makers, McLoyd and Graham say: "Some of the skulls in this collection were obtained from underground rooms that had been excavated in the clay bottoms of the caves. The largest of these rooms are as much as twenty-two feet in diameter. They have been filled in with ashes and other refuse, and the stone cliff houses constructed over them. The heads taken from these rooms are of natural form, never having been changed by pressure. No skulls of this shape are found in the stone cliff houses that are in the same caves, and no flattened skulls are found in the underground rooms. Articles found in the rooms beneath the cliff dwellings are, to some extent, different from those obtained in the stone houses above."

Wetherill makes mention of a great many depressions in the form of "pot-holes," some of which were lined with baked clay: their use may have been, primarily, the storing of grain or provisions, but a secondary and final utilization was as a grave. Mode of
Burial. In these carefully prepared places, the bodies of the people were buried. They were doubled up and placed at the bottom of the hole, then covered with beautiful feather or rabbit-skin robes and finally with baskets, either several small ones or one large carrying basket. No matter what the character or quality of the other mortuary articles might be, the basket was almost invariably in evidence.



BURDEN AND OTHER TYPES OF BASKETS

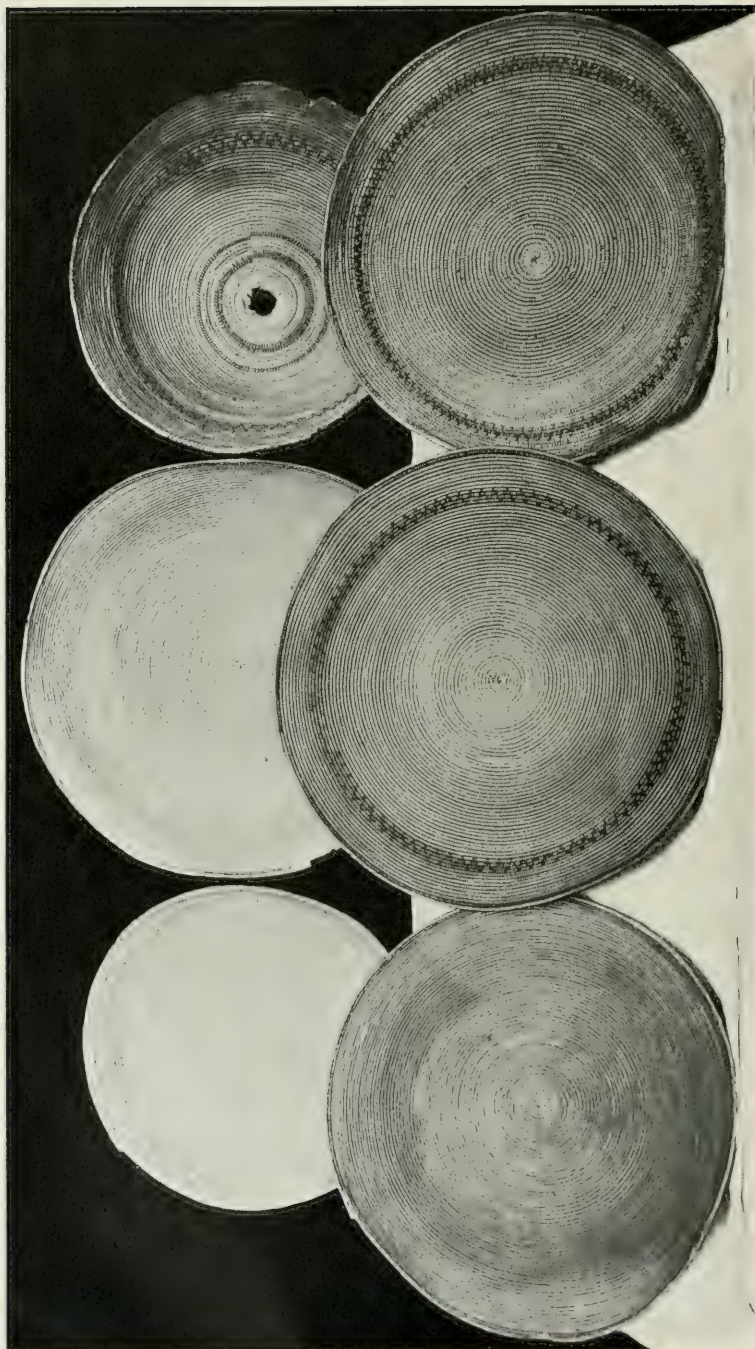
THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

The bodies exhibited, commonly known as mummies, testify forcibly to the dryness of the caves in which they were found. They were not subjected to an artificial mummifying process, as many people imagine and as the common name would imply, but were buried in the usual manner, Nature alone being responsible for their present condition. The body instead of decaying, slowly dried. The flesh wasted away, undergoing a gradual process of desiccation, until the skin, flattened on the bones by the pressure of the earth above it, became a parchment-like covering that enclosed the skeleton. This work of Nature was so wonderfully done that the individual external features and peculiarities, although somewhat distorted, are perfectly preserved. The hair, eyebrows and nails are intact, and the ears, the nose, the skin of the face and other fleshy parts of the body are so perfect that they have been rendered almost life-like by a process employed in one of our universities. Nature, in this region at least, has been kind to the archæologist, and, through her carefully prepared store-houses, has made it possible to verify many hypotheses, while at the same time she has preserved for the student many invaluable records of the past.

THE CULTURE OF THE ANCIENT BASKET MAKERS.

Although most of the ancient Pueblo people and Cliff Dwellers were masters of the art of making pottery it would seem, from the data at hand, that the Basket Makers had not developed whatever ability they may have had in that line. In fact, the majority of the vessels found with the remains of these people are of a very crude type, indicative of the first steps in fictile art as pointed out by specialists. McLoyd and Graham, in speaking of this ware, say: "The third kind of pottery is very valuable, less than fifty pieces having been found up to date, and those in the underground rooms that have been mentioned as being underneath the Cliff dwellings and in the same caves. It is a very crude, unglazed ware, some of the bowls showing the imprint of the baskets in which they were formed."

The pottery mentioned in this statement is on exhibition in



FOOD TRAYS OR MEAL BOWLS

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

the table case in front of the wall case referred to, and will be described in detail in a future publication.

The large jars on the upper shelf of the wall case containing the baskets are from the caves in which some of the remains of the Basket Makers were found, but they are from the upper levels and are the work of the Cliff Dwellers. Many were used as cooking vessels, but most of the larger ones were receptacles for corn and other provisions. Some of the jars still retain the corn and seeds that were placed there by their original owners, while others are covered with soot that shows the use made of them in the culinary department. It will be noticed that most of the large jars have rounded bottoms, necessitating a stand or base to keep them in an upright position. The stand used was in the form of a ring made either of yucca ("Spanish bayonet") or cedar bark and one of these may be seen attached to the base of a jar. It forms part of a harness made of yucca leaves, which also served to strengthen the jar, and facilitated the carrying of such a vessel. This form of jar is common throughout the greater part of the Pueblo and Cliff Dweller country, and is a good example of the ware in which the coils have not been obliterated by smoothing.

Vessels for
Cooking
and
Storage.

The bottle-necked olla and a bowl are shown as examples of another form. In these the surface has been smoothed and ornamented with painted designs. In the corrugated jars, the designs are generally incised, and are either lines or slight depressions forming figures. In the former styles of decoration a yucca brush is used, while in the latter a bone implement or stick or even the finger nail was enough to give the desired effect.

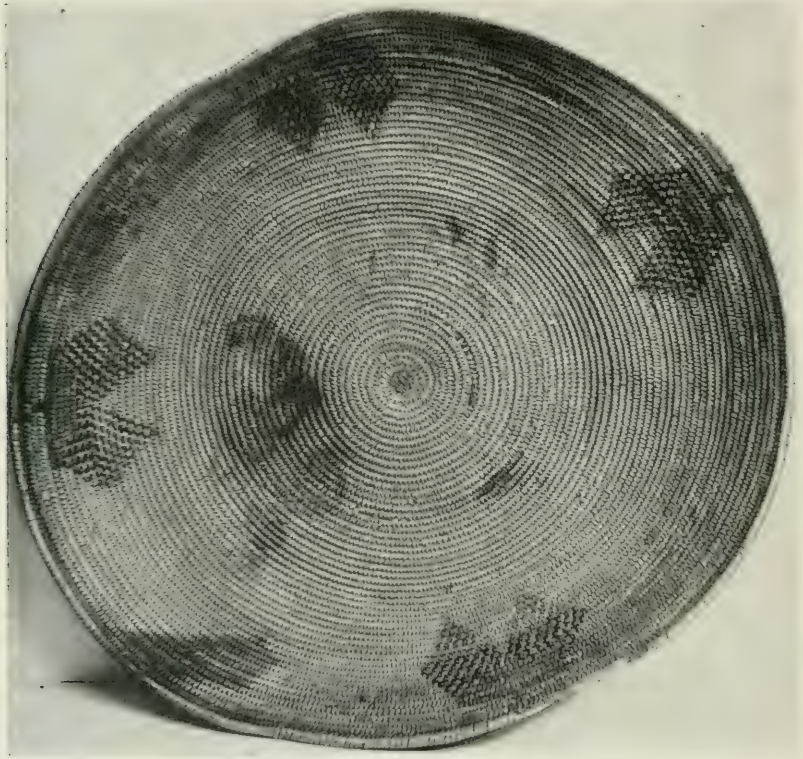
Other
Forms
of Jar.

The foot covering of the ancient sedentary people is interesting enough to fill a book with instructive text, but we must merely glance at that here shown and pass on to the great collection of baskets. The yucca plant furnished the material from which these sandals usually were made. Some were plaited from the split leaves of the broad-leaved species, while for others the entire leaf of the narrow-leaved plant was utilized. In making the sandals the progression was from the

Sandals:
Material.

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

toe to the heel. Another form, a thick pad-like sandal, was made from yucca fibre loosely woven, while a fourth was a carefully woven product, both warp and woof being yucca cord. Other materials were employed in the manufacture of these useful articles, and specimens illustrating this fact may be seen in the table case east of the one under consideration.



FOOD TRAY WITH BUTTERFLY DESIGN

There is a marked difference in shape between the sandal of the Basket Makers and that of the Cliff Dwellers. The latter **Sandals:** has a pointed toe, and there is a jog or step a few **Shape.** inches from the toe end. The sandals of the Basket Makers have square toes, apparently without exception. From the crudest form made from broad leaves to the finest woven

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

product, there is no deviation. The Wetherill brothers made this a point for special investigation, and the square-toed form seemed to persist to the exclusion of the regular cliff-house type. We have McLoyd and Graham's views in the following words: "We are of the opinion that those [sandals] with square



FOOD TRAY WITH WATER-FOWL DESIGN

toes were made by a race who inhabited the underground rooms. This view is formed from finding them buried with mummies of that race and is strengthened by the fact that we have found none in the caves where such ruins do not exist." Thus we may safely assume that this is another characteristic

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

in which the Basket Makers differ from the Cliff people: at all events, the matter is worthy of further study.

The baskets taken from the various caves of the Grand Gulch region, and shown for the first time in this case, form as complete a collection of pre-historic wickerwork as may be found in this country, and present a new field for the student of ancient weaves. All the large baskets were found with the Basket Makers. The Cliff Dwellers made baskets, and may have learned the art from these people, but most of their productions were small and unornamented. According to McLoyd and Graham: "The large flat baskets or platters have only been found in the underground rooms that have been mentioned." These large dishes or trays are well represented in the Museum exhibit.

THE WETHERILL COLLECTION.

The northern half of the case is devoted to the material collected by the Wetherill brothers and is the first collection of note that came from the Grand Gulch country. The unique character of many of these baskets would warrant a technical treatment, and the weaves, materials, dyes and designs are all deserving of a more detailed description than this account will permit.

The baskets that claim attention when the case is first approached are the ones that cover the bodies. They are really **Burden Baskets.** burden baskets and, though used to cover the bodies after death, were not specifically mortuary baskets. They are from three to four feet in diameter and are conical in form. Some of them still retain their carrying cords and show evidences of long use. As burden baskets they were no doubt used in carrying wood, grain, fruits etc. They are of the coil pattern and have the three-stick core. We find this form of basket in use at the present time among the Apaches, Pah Utes and most of the tribes of northern and central California. In the modern tribes, however, almost all baskets of this shape are of the *bam tush* weave, a weave in which the warp is perpendicular instead of being in the form of a horizontal coil.

The ornamentation here shown is angular and well defined,

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

and approaches in decorative effect the modern work of the Maidu Indians of California. The material used in the construction of the basket is willow. Splints of this material have been dyed black and a peculiar dull red, and these two colors form the design as shown in the basket on page 8.



FOOD TRAY WITH BUTTERFLY AND WATER-FOWL DESIGNS

The conical bottom of this basket has been reinforced and strengthened with heavy yucca cord, because the basket is always put down with this part resting on the ground. This feature may be noticed in the Pah Ute burden baskets of the present day, but the Pah Utes generally bind their baskets with rawhide.

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

On the first or lower shelf of the Wetherill collection there is a series of eight baskets that were probably used as food trays or meal bowls. Some may have been used as gambling trays with which to toss the bone and wooden dice, while others were, possibly, ceremonial objects that were used only on special occasions. This series is composed of specimens that are practically of the same form. They are made of willow stalks and splints and are of the "three-rod foundation" type, as illustrated and described by Professor Otis T. Mason in the *American Anthropologist*, N. S., vol. 3, No. 1, p. 122. Since almost all of the baskets made by these people are of this type, Mason's description of this particular form of weave as given in the article cited may be quoted here.

"Three-rod foundation—This is the type of foundation called by Dr. Hudson, *bam tsu wu*. Among the Pomo and other tribes in the western part of the United States the most delicate pieces of basketry are in this style. Dr. Hudson calls them the "jewels of coiled basketry." The surfaces are beautifully corrugated and patterns of the most elaborate character can be wrought on them. The technic is as follows: Three or four small, uniform willow stems serve for the foundation. The sewing, which may be in splints of willow, black or white carex root, or cercis stem, passes around the three stems constituting the coil, under the upper one of the bundle below, the stitches interlocking. In the California area the materials for basketry are of the finest quality. The willow stems and carex roots are susceptible of division into delicate filaments. Sewing done with these is most compact, and when the stitches are pressed closely together the foundation does not appear."

Accepting this description as covering the generalities of manufacture, we may proceed to the examination of a few of the individual peculiarities. Beginning with the second specimen from the right of this part of the case we have a basket seventeen inches in diameter, which is slightly concave. The stitch is the ordinary "wrap stitch" with the exception of a space about an inch and one-half from the end of the outer coil, where the

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

herring-bone stitch was used. This stitch is employed by the modern Pah Utes, Navajos, Supais and Pimas, but with these tribes the entire rim is finished in this manner. The design on this basket, as shown on page 12, is a very unusual one. Mr. T.



OPEN-WORK, OR "SIFTER," BASKET

F. Barnes of Los Angeles, California, has suggested that it may be a conventionalized representation of butterflies and **Butterfly Designs.** that the basket was probably a ceremonial one, used when a child was born, the butterfly being symbolical of the new life. In verification of this supposition, the entry in Wetherill's original catalogue shows that this basket was found over the "partially mummified remains of a child." The design is in two

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

colors. The space below the bar and between the wings is a dull red-brown, the remainder of the figure being black. These designs are not equidistant as is generally the case in ancient decorative work of this region, and the position of one of the figures directly below the finished end of the outer coil may point to a symbolic relation between the design and the closed or finished coil.

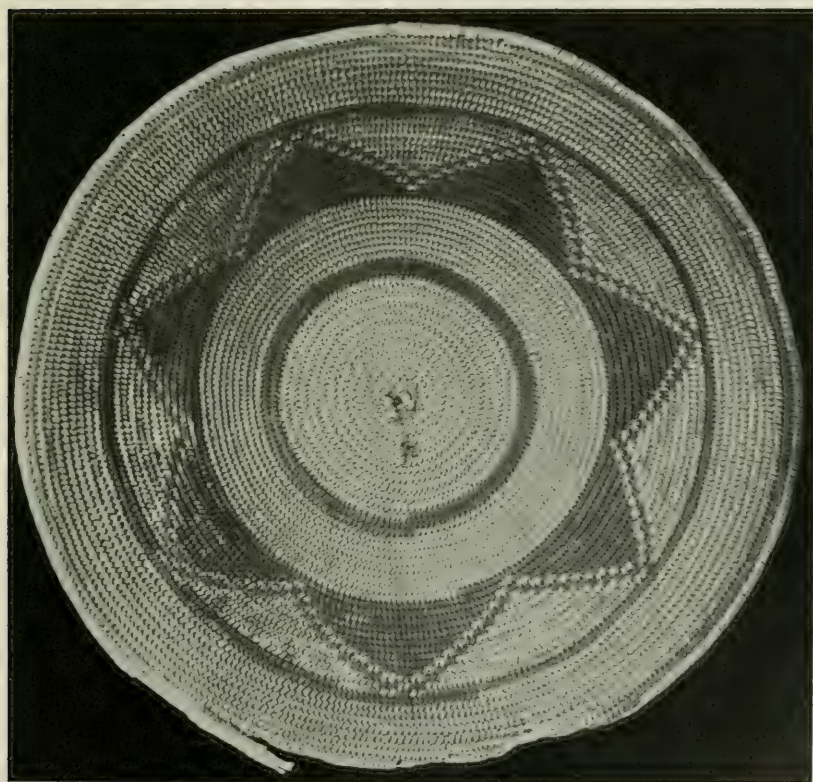
Another decoration, as interesting as it is odd, is shown in the fourth basket from the same end of the case. This basket was found in a cave and may be seen in position in the plate on page 5. In this instance the basket covered the head and upper part of the body, the remainder being wrapped in a feather-cloth robe. The figures shown in this basket, forty-four in number, were evidently made to represent ducks or other water-fowl, and they form two lines or series (p. 13). All the figures pointing in one direction are black; those facing them are dull red, and are raised slightly above the others in a horizontal plane. A line of black near the rim constitutes the remaining feature of the decoration of this basket. In size and material it is practically the same as the one just described and the design is similar, in some respects, to the fifth basket, which is also decorated with the bird figure.

In the photograph of this basket shown on page 15 it will be seen that the designs in the two baskets that have been described last are combined in this one. The bird-forms are practically

the same, but the body of the butterfly, if it be one, is represented by one instead of three parts. In the former the figure may have been made to represent the butterfly just after its emergence from the chrysalis, with the wings extended, which would have been a pretty symbolization of the new life as applied to the infant, while in the latter the wings are folded, and the butterflies, like the birds, are resting. The designs, however, may have a cosmic significance, the figures typifying the gods of the air and the water. An interesting feature of these figures is the antenna-like projection that may be noted on both baskets. There is a black coil near the rim of the basket; where this ends there are two black stitches on



BOWL-SHAPED BASKET WITH SUN-AND-MOUNTAIN DESIGN



BOWL-SHAPED BASKET WITH MOUNTAIN DESIGN

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

the outer coil. From this point to the end of the coil is a little more than an inch, and the finishing half of this portion is done in the "herring-bone stitch."

Inasmuch as all the other baskets on the shelves are of the same form and general workmanship as those already described,

Sifter we will pass on to those on the floor of the case. Here

Baskets. we find a type, shown on page 17, which is unusually interesting. It is a sifter basket of the single-stick variety and the weave is very peculiar. The basket is nine and one-half inches in diameter and two inches deep. The fact that it is a coiled basket makes it doubly worthy of notice. Sifter baskets are found among the Apaches, Pimas, Pah Utes and Pomas of the present day, which are, however, of the *bam tush* weave. Open-stitch work is seen to-day among the Klikatats of Washington and in the Attu baskets of the Aleutian islands. This basket is made of willow and is well preserved. It is not decorated, but the stitch is a peculiar one and therefore lends a charm that claims our attention. An examination of the specimen, or even of the photograph, will serve to give a better idea of the structure than could be gathered from a description.

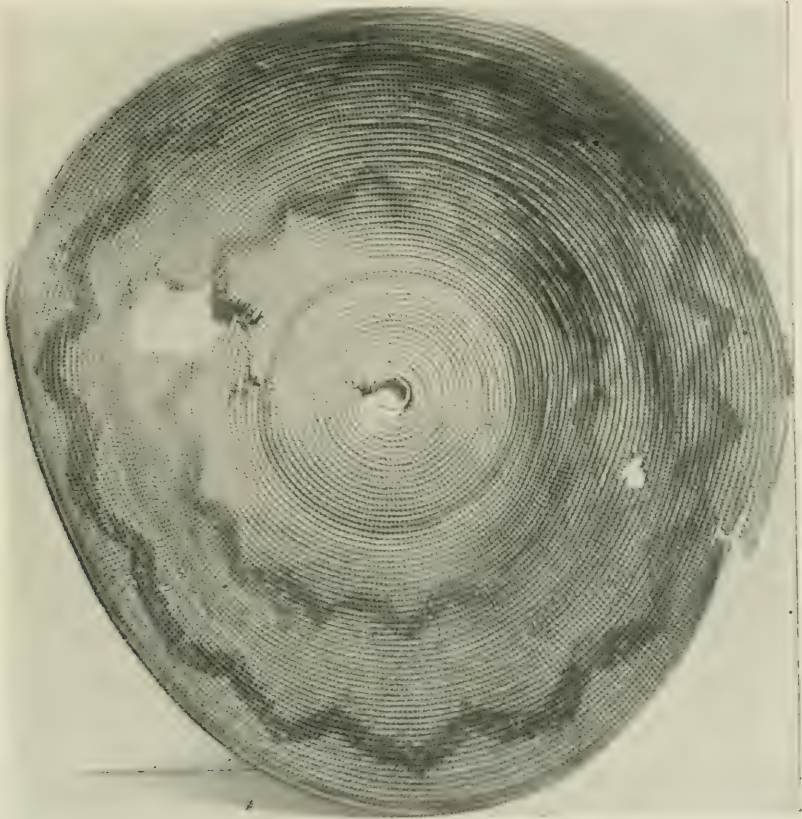
While considering the large baskets it may be well to examine those collected by McLoyd and Graham and then return to the smaller specimens in the Wetherill collection.

THE McLOYD AND GRAHAM COLLECTION.

The McLoyd and Graham collection occupies the southern half of the large case. The first specimen to be considered is the second one from the right on the first, or bottom, shelf, and it is probably the most beautiful example of pre-Columbian basket-work in existence. The basket is of the three-stick weave, with flat bottom and flaring sides, and is seventeen and one-half inches in diameter and five inches in depth. The highly ornamental geometrical design, in black and dull reddish brown, is illustrated on page 19. This basket, like many others, was found buried with the body of a child which had been wrapped in fur-cloth and deerskins. From the æsthetic standpoint, this basket is a treasure, and its utilitarian value must have been

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

as great as its ornamentation is beautiful. The split willows forming the design were dyed a glossy black and a dull reddish brown, the pattern formed of the latter color giving the effect of an under-tint. The design is bold and somewhat startling



FOOD OR GAMBLING TRAY

and is confined to the flaring part. The flat bottom presents the appearance of a disc from which wings extend; **Winged** the designs forming these appendages start from the **Design. (?)** opposite sides of its circumference, which is defined by two black lines. These wing-like figures are broad and have serrated edges. They extend to a black line that forms the second coil

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

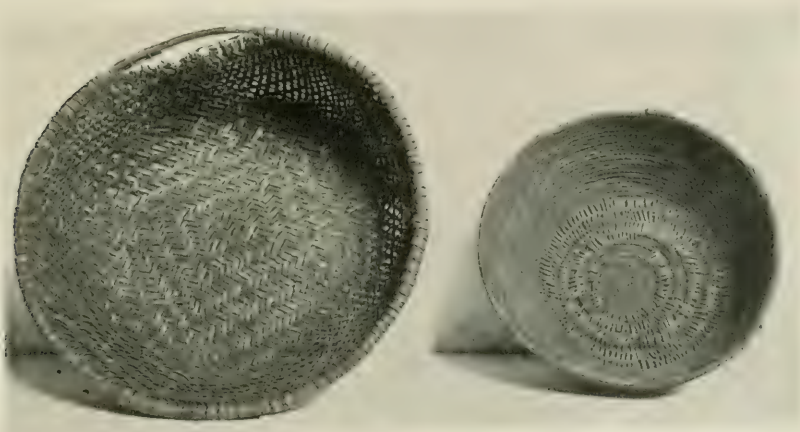
of the rim. On one side of each wing there are two well defined lines that have the appearance of wave-lines. On the other side there is a design in the dull red color that seems almost like a shadow. This too is flanked by two lines similar to the ones just mentioned. There are two designs similar to those employed by the Pomas of the present day. They are in the form of mountains and occupy positions on opposite sides of the basket. The base of these figures rests against the black line that skirts the rim and the terraced tops almost reach the rim of the central part. The most forcible impression of this ornamentation in its entirety is that of the winged sun soaring over the earth as represented by the mountains. Neither a photograph nor a description can do justice to this wonderful evidence of the work that could be done by the old people; the specimen itself must be examined if one would fully appreciate the capabilities of the ancient Basket Makers.

Another basket of beautiful design and workmanship is figured on page 19 and may be seen on the first shelf of the **Mountain Design. (?)** case. It is similar to the one just described both in shape and weave. Its special claim upon our attention is its decoration. This is in the form of heavy mountain-like figures that form a band midway of the rim. There are the same lines of black separating the bottom and upper part as seen in the other baskets, then there is a plain space before the terraces begin. There are seven of these pyramidal figures and their bases are joined, forming a rosette. The tops of the figures are toward the rim and rest against a black coil. A single black coil near the rim completes the ornamentation. This basket and the one with the wing design are the only ones in our collections with heavy designs, the tendency being toward a more delicate treatment.

A third specimen of the flat-bottomed form is shown on page 21. It has the double coil of black that forms the limit of the bottom piece and from this the sides extend, their edges being twenty inches apart. The design is in black and is formed by two zig-zag bands, one of which is near the rim and the other

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

near the bottom. This basket was found with a mummy and with it were three others. It has weathered more than the



YUCCA SPLINT BASKET

FOOD BASKET OF COILED WORK



SMALL STORAGE BASKETS

other baskets, but it is one of the largest, and the design is a very striking one. There is a gambling tray from the Tule River reservation, California, in the Briggs collection in the

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

American Museum, that has a design similar to this one, and the weave of the basket is practically the same.

Turning to the coarser weaves we have on page 23 two baskets that show conclusively that they were made for every-day use.

Coarsely Woven Baskets. One is a bowl-shaped piece eleven inches in diameter and four and one-half inches deep; it is of the usual coil pattern, but coarsely woven as compared with those already noted. This basket was used until the bottom gave out and even then it was not discarded. It was mended with strong strips of split willow and each strip included two coils. The basket was strengthened to such an extent by this reinforcement that it was really as good as new. The second basket shown on this page is made of yucca leaves. It is fourteen inches in diameter and four inches deep. This form and weave are common among most of the modern Pueblo tribes and even the finish is the same. It is also found among the Apaches and Pimas. The rim is a willow stick over which the yucca ends have been bound and tied, the tying being done on the outside. A number of smaller baskets of this type are shown in the case and one of them is figured on page 23 among the baskets shown with their original contents.

The basket last mentioned is exactly like the large yucca one, except in size, and in the plate cited we may see it as it was found. It is filled with beans, which must have been raised in quantities by the ancient people, since a great many have been found in the debris of the rooms.

The basket shown above the one just mentioned is rather peculiar in form, since the bottom is oval, a rather unusual shape in pre-historic baskets. Most of the baskets from the **Oval Baskets.** caves are round, but several of the oval form have been found; enough, in fact, to show that the shape is not a freak. This specimen is eight inches long, three and one-half inches wide at the top, two inches wide at the bottom, and four and three-quarter inches long. Its depth is four inches. This basket is of the three-stick weave, and the materials used are the same as in the others. The bottom is flat and there are two coils of black separating the top and bottom. There are two pointed

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

designs in black near the rim on either side. When found, these baskets were filled with popped corn, piñon nuts and seeds.

In the lower right-hand corner of the same photograph there is represented a small basket containing feathers which were kept in place by means of a piece of cotton cloth completely filling the upper part of the basket.



YUCCA BASKET AS FOUND IN A CAVE, GRAND GULCH UTAH

The remaining three baskets represented on page 23 are of the "in-curve" form. Two have flat bottoms, but the third is like an olla in shape. They have the three-stick core, "**In-curve**" and the weaving of the two shown in the left part of **Baskets**. the picture is the same as that already described. The third, in the upper right-hand corner, has what is known as the "skip stitch," which may be seen in some of the old Pima baskets. The ordinary in-curve basket is found among the modern Pomos of California, but is extremely rare among ancient peoples. These baskets, although not as pretentious as the larger ones, present a phase of the domestic life that appeals to the student, because they are the receptacles for holding the little things that are so common and yet so essential in the every-day life.

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH

Some were storage baskets in which seeds were kept, perhaps for the next season's planting. One of them contains piñon gum, which was their paste and glue. With this gum they mended their broken vessels and made their baskets water-tight, as may be seen by the olla-bottomed basket represented in the plate. This little water bottle is filled with pumpkin seeds and the covering of gum has rendered it water-tight.

Another form of basket that may be considered under this class is shown on page 25. It is more like a yucca bag than a basket, and yet it is made in the same way as are the other yucca productions. It is really a small storage basket and it is here shown filled with shelled corn while about it are scattered ears of corn. This basket and corn were found in a pot-hole in a cave and were no doubt cached in this place for future use. Near the basket just described and leaning against the back of the case **Mortar** is a specimen that is evidently a mortar basket. It is **Basket.** thirteen inches in diameter and three and one-half inches deep. The interior is coated with meal and the surface of the coils is worn as though from blows of a pestle or grinder. The home of the mortar basket is in California and, should future investigations show that this form of basket was used by the ancient people of Utah, it will mark the eastern limit of the type, so far as known.

Much more might be said concerning these interesting objects. Those that have been noted are worthy of a detailed description and there are more than fifty others in this case that must be passed without even mention. The collection as a unit may be studied with the help of this introduction, which will prepare the student for more specific information regarding the arts of the Basket Makers.

NOTE.—The various types of baskets mentioned in this description of the remains of the pre-historic inhabitants of south-eastern Utah are also to be seen in the basketry of the Indian tribes now inhabiting California and other parts of the western United States, examples of which are on exhibition in the West hall, ground floor; and in that of the natives of British Columbia, Alaska and the Aleutian islands, as exhibited in the North hall, ground floor. Inasmuch as the same design expresses different ideas when used by different tribes, it is well for the reader to bear in mind the point made clear in the text by the author of this Leaflet, that the interpretation offered here for the designs on the pre-historic baskets is wholly conjectural.—EDITOR.

The American Museum Journal

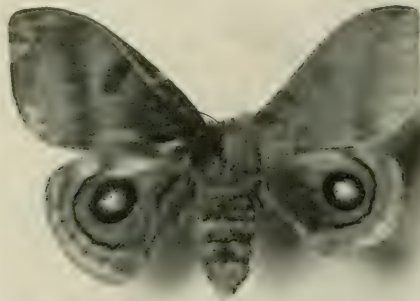
VOL. II.

MAY, 1902

No. 5.



UR "Guide Leaflet" this month pertains to the Local Collection of Butterflies which is on exhibition in the Central hall of the third or gallery floor. It has been prepared by Mr. William Beutenmüller, Curator of Entomology, and is intended to be used for field identification of the species, as well as in the study of the specimens in the cases. All forms of nature-study are of interest and value in the education of children, but entomology seems to present some especially attractive features. The identification and study of the larger forms of the butterflies, moths, beetles, flies and so on is not difficult, and the habits of observation inculcated by the exercise are of lasting value to the pupil.



THE IO MOTH

(*Automeris io*) Hermaphrodite form, natural size.

In the collection of local Lepidoptera formed by the late S. Lowell Elliot, and presented to the Museum by Mrs. M. Schuyler Elliot, there is a very interesting specimen of a hermaphrodite

THE AMERICAN MUSEUM JOURNAL

form of the Io moth (*Automeris io*). The left side of the specimen shows, in the coloration of the wings, head, thorax and legs, and the structural characters of the antennæ, the features of the normal male, while the corresponding right side shows the features of the normal female, except the hind leg, which is like that of the male. In shape and size, the abdomen is like that of the female, while in color it is like that of the male, except that the under side is dull brown, as in the female.

NEWS NOTES.



DEPARTMENT OF VERTEBRATE PALÆONTOLOGY.—The preparation of the series of skeletons and bones representing the development of the horse, provided for by the liberality of William C. Whitney, Esq., is progressing satisfactorily.

The skeleton of the three-toed horse, *Anchitherium*, which was discovered last season, has been mounted and placed on exhibition in the Hall of Fossil Vertebrates. This specimen has been the means of determining positively the occurrence of this marsh-living horse in this country, and has enabled Professor Osborn and his assistants to clear up the doubtful relations of many specimens which were obtained by Professors Leidy and Cope, but which were too fragmentary to be classified satisfactorily. *Anchitherium* was an animal about as large as a small Shetland pony, and differed especially from the Plains horses by having short-crowned teeth and by its broad-spreading three-toed feet which enabled the animal to walk over soft ground without sinking.

The Museum has also secured recently from South Dakota a considerable portion of an excellent specimen of *Mesohippus bairdi*, which, together with material already in the collection, will make possible the mounting of a skeleton showing this stage in the development of the Horse. *Mesohippus* was about the size of a sheep.

In preparing the comparative series of skeletons showing the

THE AMERICAN MUSEUM JOURNAL

differences produced in the horse by breeding or artificial selection, Professor Osborn has enlisted the aid of Professor J. C. Ewart, who is well known for his experiments at Penicuik, Scotland, in the interbreeding of horses and zebras. From Professor Ewart the Museum has secured a perfect Shetland pony, only $31\frac{1}{2}$ inches high, the smallest on record. The first of the series of horse skulls showing the development of the teeth will soon be placed on exhibition.

Six water-color paintings of horses, asses and zebras have been completed by Mr. Charles R. Knight, and put on view. This series has been made partly as a color-study for use in preparing the restorations of the extinct horses.

The type specimens of the species of horses described by Dr. Joseph Leidy have been loaned to the Museum by the United States National Museum and the Philadelphia Academy of Sciences, for purposes of comparative study.

The exhibit of Titanotheres in the northwest corner of the Hall of Fossil Vertebrates has been entirely rearranged to accord with the results of the studies which Professor Osborn has been making during the past winter for the United States Geological Survey. Small models of the heads of the four principal types of Titanotheres and of the ancestral form and a model of the running *Brontotherium* have been prepared by Mr. Knight, and are to be placed on exhibition near the fossil bones.



DEPARTMENT OF MAMMALOGY AND ORNITHOLOGY.—Mr. Frank M. Chapman, the Associate Curator of the Department of Mammalogy and Ornithology, is spending his vacation in making a cruise among the Bahama Islands, on a schooner chartered for the purpose, and is making collections of the birds and carrying on special studies of their habits.

THE course of Saturday afternoon talks and laboratory exercises in ornithology, given in the auditorium of the Museum during April and May, has proved to be popular, and is considered very instructive and helpful by the large number of teach-



THE RED-EYED VIREO

From one of two unpublished paintings by J. J. Audubon, obtained by the Museum through the liberality of Percy R. Pyne, Esq.

THE AMERICAN MUSEUM JOURNAL

ers and others who have attended the exercises. The programme of the series was given in the last number of the JOURNAL.

THE head of a large African elephant, mounted in realistic style, has been hung on the wall of the East Corridor hall of the second floor, and an excellent head of the two-horned African rhinoceros has been put in a similar position on the third floor. These specimens have been deposited with the Museum by Mr. William F. Whitehouse, Jr., of Banbury, England, an enthusiastic hunter of large game.

THE head of a large Alaskan moose, presented by Mr. L. S. Thompson, has been mounted and placed in the East Corridor hall, near the entrance to the main mammal hall. The head is remarkable, not only for its size, but also for the unusual development of the antlers, a series of tines having grown out from the middle of the palms on each side.

THE Osprey group, the material for which was collected last year on Gardiner's island by Mr. Frank M. Chapman, has been completed and placed on exhibition in the West Corridor hall of the third floor. It makes a notable addition to the series of groups representing the life history of birds.

THE birds and mammals brought back by Mr. N. G. Buxton as a result of his visit to northeastern Siberia, in connection with the Jesup North Pacific expedition, have been examined by the Department of Mammalogy and Ornithology. The material proves a valuable addition to the collections of the Museum for the purposes of study and exhibition. The value of Mr. Buxton's observations in Siberia is enhanced by the large series of photographs which he brought back with him.



DEPARTMENT OF ANTHROPOLOGY.—The Museum is fortunate in having procured for the Department of Anthropology the Raff collection of wood-carvings from the tribes of western Africa. The objects are mostly of religious or ceremonial character. All are old and in an excellent state of preservation.

THE AMERICAN MUSEUM JOURNAL

THE ethnological material collected by Mr. A. J. Stone on his first expedition to Alaska has been acquired by the Museum. The objects were obtained, for the most part, along the Mackenzie river and the Arctic coast and represent the early culture of tribes which have been greatly affected in late years by French missionaries.

MR. WALDEMAR BOGORAS has returned from his travels in Siberia, in connection with the Jesup North Pacific expedition, notices of which have appeared in the JOURNAL from time to time, and has begun the study of the large amount of material which he has collected and sent to the Museum.

GEORGE FOSTER PEABODY, Esq., has furnished the Museum with funds for the purchase of the Steiner collection of archaeological implements from Georgia, which forms a desirable addition to the Museum series representative of North American archaeology.

B. TALBOTT B. HYDE, Esq., has purchased the Andrew E. Douglass library, which has long been at the Museum with the Douglass collection, and which contains many rare treasures of archaeological literature, and has made it available for use in connection with the Hyde exploring expedition.

MISS M. W. BRUCE has presented the Department of Mineralogy with a large and showy group of calcite crystals from Joplin, Missouri. The chief feature of the group is a large composite scalenohedron, the top of which is capped by a single turban-shaped crystal.

EARLY in April Professor R. P. Whitfield returned from his vacation, which he spent visiting southern California.

MR. GEORGE H. SHERWOOD, the Assistant Curator of the Department of Invertebrate Zoölogy, has gone to Woods Hole to continue the experiments on the artificial propagation of the lobster which have been under way for some years by the United States Fish Commission.

THE AMERICAN MUSEUM JOURNAL

RECENT PUBLICATIONS.

THE following articles of Vol. XVI (1902) of the Museum "Bulletin" have been issued up to April 23:

A New Species of Elk from Arizona. By E. W. Nelson. 12 pages, 7 text illustrations.

Zimmermann's 'Zoologiæ Geographicae' and 'Geographische Geschichte' Considered in their Relation to Mammalian Nomenclature. By J. A. Allen. 10 pages.

The Crania of Trenton, New Jersey, and their Bearing upon the Antiquity of Man in that Region. By Aleš Hrdlička. 40 pages, 4 text figures, 22 plates.

Description of a New Form of Myalina from the Coal Measures of Texas. By R. P. Whitfield. 4 pages, 2 text illustrations.

Observations on and Emended Description of *Heteroceras simplicostatum* Whitfield. By R. P. Whitfield. 6 pages, 5 plates.

Description of a Tereido-like Shell from the Laramie Group. By R. P. Whitfield. 4 pages, 1 text figure, 2 plates.

The Four Phyla of Oligocene Titanotheres. By Henry Fairfield Osborn. 19 pages, 13 text illustrations.

Dolichocephaly and Brachycephaly in the Lower Mammals. By Henry Fairfield Osborn. 13 pages, 5 text illustrations.

The Generic and Specific Names of Some of the Otariidæ. By J. A. Allen. 8 pages.

A New Caribou from the Alaska Peninsula. By J. A. Allen. 9 pages, 6 text illustrations.

A Skull of Dinocyon from the Miocene of Texas. By W. D. Matthew. 8 pages, 4 text illustrations.

On the Skull of *Bunælorus*, a Musteline from the White River Oligocene. By W. D. Matthew. 4 pages, 3 text illustrations.

A New Bear from the Alaska Peninsula. By J. A. Allen. 3 pages, 2 plates.

A New Sheep from the Kenai Peninsula. By J. A. Allen. 4 pages, 2 text figures.

Description of a New Caribou from Northern British Columbia, and Remarks on *Rangifer montanus*. By J. A. Allen. 10 pages, 6 text figures.

THE AMERICAN MUSEUM JOURNAL

ATTENDANCE AT THE MUSEUM DURING 1901.

Department of Public Instruction:	
Lectures to Teachers.....	12,491
Lectures to Members.....	8,998
Holiday Lectures to the Public.....	5,056
Columbia University Course of Lectures.....	2,372
Board of Education, "Free Lectures to the People":	
Tuesday Evening Course.....	41,543
Saturday Evening Course.....	5,551
Meetings of Societies:	
Audubon Society.....	254
Linnæan Society.....	182
Entomological Society.....	100
Anthropological Society.....	43
Mineralogical Club.....	31
Convention of the American Ornithological Union....	275
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Total attendance, lectures, meetings and conventions	76,896
Other visitors to the Museum.....	384,130
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Total attendance for the year.....	461,026

THE BUTTERFLIES OF THE VICINITY OF NEW YORK CITY.

BY WILLIAM BEUTENMÜLLER,

Curator, Department of Entomology.

BUTTERFLIES and moths belong to the order of scaly-winged insects or "Lepidoptera." The two may be distinguished readily by the fact that the butterflies have the tips of the antennæ thickened into knobs, while the antennæ of the moths are thread-, comb-, or feather-like. Butterflies fly in the sunshine, but moths generally are night fliers.

The eggs of butterflies are far more variable in shape than are those of moths and insects of other orders, and their surface often is elaborately ornamented with raised lines and spots. They are laid singly or in masses. The caterpillars are long and cylindrical, and are composed of twelve joints or segments besides the head. Each of the first three segments bears a pair of simple, short, articulated feet. These three segments represent the thorax, and the remaining nine the abdomen, of the perfect insect. The sixth to the ninth and the last joints of the caterpillar as a rule are furnished with a pair each of thick, fleshy limbs, termed "pro-legs." These legs have powerful muscles and are provided at their extremities with a great number of minute recurved hooks which enable the caterpillar to hold to its place of rest. When fully grown, they suspend themselves from some convenient object by means of a silken button, some using a silken thread around the body in addition to the button, and change into chrysalids.

The present Guide Leaflet¹ is a popular account of the butterflies which are to be found within approximately fifty

¹ Those who are interested in pursuing the study of these butterflies further, are referred to the author's "Butterflies Found within Fifty Miles of New York," Bulletin American Museum of Natural History, Vol. V, pp. 241-310, 1893.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

miles of New York City and is intended to be used not only in connection with the Local Collection on exhibition in the Museum, but also as a concise handbook for the purpose of identifying the species in the field. The butterflies found in the vicinity of this city are representative of four families, the Papilionidæ, the Nymphalidæ, the Lycænidæ and the Hesperidæ, and will be described in that order. The figures used in illustrating the species are all natural size, and most of them show the under as well as the upper side of the wings. Some of the figures illustrate also the wings of the female. The collection has been installed in the flat cases on the railing of the gallery in the Central hall of the third floor.

Family PAPILIONIDÆ.

The butterflies of this family found in the vicinity of New York are divided into two subfamilies: viz., Papilioninæ and Pierinæ.

Subfamily PAPILIONINÆ.

These are large butterflies, commonly known as Swallowtails, because of the tail-like appendages on the hind wings. In the tropics some species occur without these tails. The antennæ are slender, the knob at the tip either straight or curved. The body is provided with six feet fitted for walking. The caterpillars are usually smooth or are provided with fleshy protuberances, and in the upper part of the first segment is a forked scent-organ which may be thrust out or drawn in at will. This organ gives off a disagreeable odor when extended, which serves as a protection to the caterpillar. The chrysalids are attached by the tail to a button of silk, and the body is suspended obliquely in a loop of silk that passes around it a little in front of the middle. The species of *Papilio* may be separated readily by the following synoptic table:

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

Synopsis of the Papilioninæ.

With very long tails.

Pale green, with black borders and stripes. *Papilio ajax*.

With short tails.

Ground color black.

With bluish or greenish reflection. *P. philenor*.

With bands composed of yellow spots. *P. asterias*.

With hind wings very thickly clouded with green
scales (male) or blue scales (female). *P. troilus*.

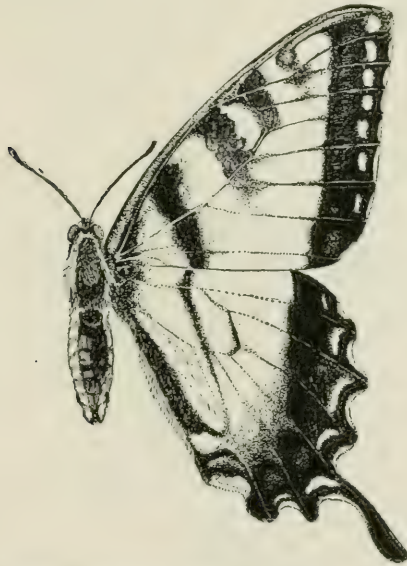
With yellowish spots and broad band at base of
hind wings *P. cresphontes*.

Ground color yellow,

With black bands and stripes. *P. turnus*.

Ground color sooty brown,

With black bands and stripes *P. turnus*, var. *glaucus*.



1. Tiger Swallowtail (*Papilio turnus*).

This butterfly inhabits all sections of the United States and Canada from the Atlantic coast to the Rocky mountains. In the vicinity of New York it is common and double-brooded, the first brood appearing in the latter part of May and June, and the second in July and August. The butterfly is yellow with transverse black bands.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

An aberration occurs in the female which is sooty brown, instead of yellow, with the black markings faintly visible (var. *glaucus*). The female lays her eggs singly on the upper surface of a leaf, and the young caterpillar takes up its abode on the same side, reposing on a bed of silk, which it spins for the purpose of retaining its hold on the smooth surface of the leaf. When disposed, it goes to the edge of the leaf to feed. As the caterpillar increases in size, the leaf is somewhat drawn together, making the animal difficult to discover. It is green, and has on each side of the third segment an irregular oval, greenish-yellow patch edged with black and enclosing a purple spot. At the junctions of the fifth and sixth segments is a transverse, narrow, yellow and black band. It feeds on apple, quince, plum, thorn, cherry, birch, basswood, ash, alder, willow, oak, tulip-tree etc.

In the Hall of North American Forestry there is a group showing a branch of the tulip-tree bearing male and female butterflies, the caterpillar and the chrysalid of this species, and illustrating the effect the insect has upon the leaves of the tree.



2. Black Swallowtail (*Papilio asterias*).

Very common in open fields, especially where the wild parsnip grows, from May to October, but it is most common in August.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

The butterfly is black, with two rows composed of yellow spots on each wing. The hind wings have blue scales or dashes between the two rows of spots. In the female the yellow spots are much smaller, and the blue scales very prominent. The caterpillar is bright pea-green, with a transverse black band on each segment, containing a row of yellow spots. It feeds on parsley, parsnip, celery, carrot and other allied plants. The species is found in Canada and the United States from the Atlantic to the Pacific coasts, in Mexico, Central America and the Antilles.



3. Green Clouded Swallowtail (*Papilio troilus*).

Found in open, sunny spots and along wood paths from the latter part of May until late in June, and again in August. The butterfly is velvety black, with a row of pale yellowish spots near the outer border on the fore wings. The hind wings are densely clouded with green scales in the male, with blue in the female. It is a common species, being distributed over a large area in America north of Mexico. The caterpillar lives on sassafras and spice-bush. It is green, with two very conspicuous eye-like spots on the third segment. It spins a silken web on the leaf on which it abides, drawing the leaf together lengthwise.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



4. Giant Swallowtail (*Papilio cresphontes*).

This handsome Swallowtail Butterfly is one of the commonest insects in the South, and is seen everywhere flitting about in the orange groves. When first discovered, it was thought to be restricted to the South, but within the last twenty years the butterfly has extended its range very much, being now found as far north as Canada. In the vicinity of New York it is not common. It is double-brooded; the first brood appearing in June and the second in August. It may be known by its large size and its deep black wings, with a row of large, rounded, yellow spots running obliquely from the apex to near the base. From about the middle of this row begins a row of spots which runs to the hind angle. The hind wings have a rather broad band across the base, and a series of large yellow spots running from the apex to the inner angle. The under side is almost entirely yellow. The caterpillar is dark brown with a white band on each side,

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

extending from the head to a large whitish patch, mottled with olive and brown. At the end of the body is also a whitish patch. A number of rings are scattered over the body, especially on the anterior parts.

In Florida, the insect is a pest to the orange, and, on account of the large size and voracity of the caterpillar, it is commonly known as the "Orange Dog." It does considerable damage, especially to young trees, which are often completely defoliated. In the North it feeds on the hop-tree (*Ptelea trifoliata*). The female butterfly deposits about five hundred eggs; she scatters them over a wide area, seldom laying more than four or five upon a single plant.

The effect of this insect upon the hop-tree is illustrated by a group in the Hall of North American Forestry consisting of a branch of the tree with male and female butterflies, the caterpillar and the chrysalid.



5. Zebra Swallowtail (*Papilio ajax*).

A pale green species with black borders and transverse stripes; hind wings with a red spot at the anal angle, and with very long tails. Only a few specimens have been seen flying or have been taken in this vicinity. It is common in the Southern and Western States. The caterpillar lives on papaw.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



6. Blue Swallowtail (*Papilio philenor*).

Common in this neighborhood, but rather local, owing to the scarcity of the food-plant, snake-root (*Aristolochia serpentaria*). It may be found in May and June, and again in August and September, in open woods, and in gardens, where the caterpillar feeds on the cultivated Dutchman's-pipe (*Aristolochia siphon*). The butterfly may be known easily by the velvety black wings with greenish or bluish metallic reflections, and the row of large orange spots on the hind wings below. The caterpillar is velvety black with long black and orange fleshy tubercles and orange spots. It is found throughout the United States and Canada, and in Mexico.

Subfamily PIERINÆ.

The species belonging to this subfamily are usually of medium size, nearly always white, orange or yellow. They have no tail-like appendages on the hind wings. The inner border of the hind wings is bent downward, forming a channel in which the abdomen rests. They are pretty and graceful, with a tolerably swift, irregular flight. They are known as white, yellow, sulphur or orange butterflies. The caterpillars are

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

cylindrical, usually with very fine short hairs. They also lack the scent-organ of the Papilios. They live almost exclusively on plants belonging to the pulse family (Leguminosæ) and the mustard family (Cruciferæ). The chrysalids may be distinguished at once by the presence of a single pointed projection in front, and sometimes they are very much enlarged ventrally, so as to be almost triangular in shape. The eggs are much longer than broad, taller than those of any other group of butterflies; they are vertically ribbed, and almost invariably laid singly, though sometimes in open clusters.

Synopsis of the Pierinæ.

Pieris.

White, with black spot on fore wings (two in the female) . . . *P. rapæ*.
Pure white, without markings *P. oleracea*.
With veins on under side of hind wings heavily bordered with
greenish scales *P. protodice*.

Euchloë.

Upper wings falcate, tipped with orange in the male *E. genutia*.

Catopsilia.

Wings bright lemon-yellow *C. eubule*.

Colias.

With silvery spot in middle of hind wings beneath.

Wings sulphur-yellow, with black borders *C. philodice*.

Wings orange, with black borders *C. eurytheme*.

Fore wings with a yellow "dog's-head" patch *C. cæsonia*.

Eurema.

With no silvery spot in middle of hind wings beneath.

Wings bright orange, with black borders *E. nicippi*.

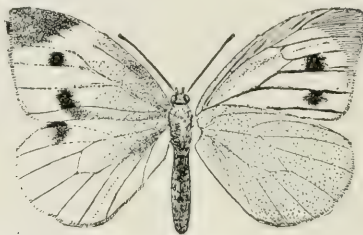
Wings lemon-yellow, borders black, with ferruginous spot
on apex of hind wing beneath *E. lisa*.

7. White Cabbage Butterfly (*Pieris oleracea*).

This butterfly may be known from its congeners through its having the upper side of the wings entirely white. It is three-brooded, the first brood appearing from the latter part of April until about

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

the middle of May, the second late in June until early in July, and the third from late in July until early in September. The spring brood has the under surface of the hind wings and tips of the fore wings heavily washed with yellow, while the summer broods are entirely pure white. The caterpillar is pale green, covered with fine, short, white hairs, and has a dark green line along the back. It feeds on various kinds of cruciferous plants such as cabbage, turnip, radish, mustard and horseradish.



8. Imported Cabbage Butterfly (*Pieris rapæ*).

This species is an importation from Europe, and is exceedingly common from May until November. It may be seen everywhere, in gardens, pastures and other places, but especially in cabbage fields. It was first noticed on this continent in Quebec, Canada, about 1860, whence it gradually extended its range. In 1868 it was independently introduced at New York. Since then the butterflies have spread from Canada to Florida and westward to the Pacific coast. The caterpillar lives on all kinds of cruciferous plants, such as cabbage, to which it is particularly injurious, cauliflower, turnip and radish.



9 Southern Cabbage Butterfly (*Pieris protodice*).

This butterfly is white with black dashes and spots. There are two broods each year, the first coming out in May and June and the second from about July to October. The caterpillar lives on

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

cabbage and allied plants. The species is found in the United States from ocean to ocean, and also in Mexico. It was common about New York in former years, but since the introduction of the Imported Cabbage Butterfly it has disappeared almost entirely, though it is sometimes common for only a season or two in certain localities.



10. Dog's-Head Butterfly (*Colias cæsonia*).

This southern species is occasionally taken in this vicinity. In the South it is common. It may be known readily by the yellow dog's-head patch on the fore wings, and broad black borders.



11. Clouded Sulphur Butterfly (*Colias philodice*).

Very common everywhere in this neighborhood, along roadsides, in open fields and in gardens. It is especially common when the red clover is in blossom. Sometimes hundreds of these yellow butterflies may be seen in dense masses upon wet spots in the road, swarming when disturbed and settling again when the interruption ceases. It is apparently triple-brooded, and may be found on the wing from the latter part of April until about the middle of October. The

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

butterfly is readily known by its sulphur-yellow wings with black borders. A pale form of the female occurs in which the wings are whitish or yellowish-white; sometimes a male form occurs which is thickly covered with black scales, so as to obscure the yellow ground color. The caterpillar lives on clover and allied plants.

12. Orange Sulphur Butterfly (*Colias eurytheme*).

Very rare in this vicinity, but common in the Southern and Western States. It differs from *Colias philodice* in having the wings orange instead of yellow. The caterpillar lives on clover.



13. Orange-Tip (*Euchloë genutia*).

This pretty species is local, and appears to be restricted to certain localities. It is on the wing early in May, and flies until about the middle of that month. The butterfly is white with the tips of the fore wings orange in the male; the under side of the hind wings is marbled with green. The caterpillar is dark yellowish-green, glossy, with a yellow stripe along the back and a broader white one on each side. It feeds on rock cress (*Arabis*).



14. Orange Butterfly (*Eurema nicippi*).

About 1880 this beautiful species appeared in considerable numbers in Central Park, New York City, and other places around New York, but since then only a few specimens have been taken. The butterfly is found from the Atlantic to the Pacific, and in most of the States south of Lat. 40° in Mexico and in Central America. In the South it is very abundant. The caterpillar lives on senna (*Cassia*).

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



15. Little Sulphur Butterfly (*Eurema lisa*).

A small yellow species with black borders. Rather common in sandy places in June and again in the latter part of August and early in September. The caterpillar is grass-green, with minute hairs and white elevation; feeds on clover and senna (*Cassia*).



16. Cloudless Sulphur Butterfly (*Catopsilia eubule*).

This species may be recognized by its large size and sulphur-yellow wings. The caterpillar feeds on different species of senna (*Cassia*). It is a common species in the South, but is rarely met with in the vicinity of New York, a few specimens having been taken in recent years in September and October. In 1870 it was found in abundance on Fire Island, L. I., and numbers were also seen at Long Branch some years ago. It has also been taken in different places on Long Island, Staten Island, Manhattan Island, Westchester County and New Jersey. It is found from New England and Wisconsin to Patagonia, S. A.

Family NYMPHALIDÆ.

The members of the family found in this vicinity are divided

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

into the following subfamilies: Euploëinæ, Nymphalinæ, Satyrinæ and Libythenæ.

Subfamily EUPLOËINÆ.

This subfamily is almost entirely confined to the equatorial regions of America and Asia. The butterflies average far above medium size, and have rounded, somewhat elongate wings. Their flight is powerful and sustained, although usually slow. They often sail high in the air on expanded wings. The eggs are slender obconic, vertically ribbed and transversely striate, and are laid singly on the food-plant. The caterpillars have two or more segments each with a pair of long, slender, flexible filaments above. The chrysalids are always suspended from a silken button at the hinder part. Only a single species of this family is found in this vicinity—the Milkweed Butterfly.



17. Milkweed or Monarch Butterfly (*Anosia plexippus*).

Very common in this vicinity, appearing in May and June, but becoming more numerous in August and September. In years when conditions have been favorable to the insects' increase, immense swarms of the butterfly may often be seen in autumn migrating southward. It inhabits North America, South America, West Indies, Sandwich Islands, Australia, New Zealand and the Malay Archipelago. The caterpillar lives on milkweed, and the chrysalid is pale green with golden markings.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

Subfamily NYMPHALINÆ.

This is the most extensive subfamily of butterflies and embraces an almost infinite variety of forms in every stage of its existence. The flight of the butterflies is usually strong. They generally pass the winter as a butterfly or a caterpillar, and in no instance does the egg hibernate.

Our species may be separated by the following table:

Synopsis of the Nymphalinæ.

Argynnis.

Orange-brown with black markings; hind wings with silver spots beneath.

Large species.

Upper side of hind wings black, with a bluish reflection and two rows of spots. *A. idalia.*

Under side of hind wings with a broad yellowish band. *A. cybele.*

Under side of hind wings with a narrow yellowish band. *A. aphrodite.*

Small species.

With silver spots on under side of hind wings. . . . *A. myrina.*

Rusty brown on under side of hind wings and without silver spots. *A. bellona.*

Euptoieta.

Upper side fulvous, with black markings; under side of hind wings with brown and ashen-gray shades. *E. claudia.*

Melitæa.

Black, with rows of pale yellow spots, and a row of brick-red spots along the outer borders. *M. phaëton*

Brown and black, similar to *P. nycteis*.

Under side of hind wings checkered. *M. harrisii.*

Phyciodes.

Upper surface fulvous, with black markings.

Under side of hind wings with silvery white bands. . . . *P. nycteis.*

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

Under side of hind wings with grayish, brown and ochraceous blotches (form *marcia*), or entirely ochraceous with a brown outer patch (form *morpheus*), and with transverse brown lines. *P. tharos*.

Polygonia.

Wings falcate ; brown with black markings.

Under side of hind wings with a broken C *P. interrogationis*.

Under side of hind wings with C not broken. *P. comma*.

Under side streaked with black lines. *P. progne*.

Under side marked with olive-green on the outer parts. . *P. faunus*.

Hind wings above with a large white spot on the costa. . *P. j-album*.

Vanessa.

Wings velvety brown, with yellow borders. *V. antiopa*.

Smaller in size, with a broad fulvous transverse band on each wing. *V. milberti*.

Pyrameis.

Wings velvety brown, with an oblique red band. *P. atalanta*.

Wings fulvous with black markings.

With two large eye-like spots on under side of hind wings. *P. humera*.

With five small eye-like spots on under side of hind wings. *P. cardui*.

Junonia.

Wings sepia-brown, with large eye-like spots above. *J. cænia*.

Limenitis.

Reddish brown with black borders and veins, and a transverse band across the middle of the hind wings. . *L. disippus*.

Velvety black, with metallic blue shades and spots. . . . *L. astyanax*.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



18. Regal Fritillary (*Argynnis idalia*).

Found during July and August in swampy meadows or adjacent fields, and it is sometimes common locally. When feeding, the butterfly nervously flutters its wings and darts off at the least disturbance. It is single-brooded, and hibernates as a caterpillar. The caterpillar feeds on violets.



19. Great Spangled Fritillary (*Argynnis cybele*).

Rather common in swampy places. Makes its appearance in the latter part of June, and is found throughout July and the early part of August. The caterpillar lives on violets and hibernates.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

20. Silver-Spotted Fritillary (*Argynnis aphrodite*).

Orange-brown with black spots. Closely allied to *A. cybele*, but may be separated from that species by its smaller size and the absence of the dark basal area on the fore wings above in the male, and also by the narrower yellow field between the outer margin and the brown basal color on the under side of the hind wings. It is found in wet meadows and overgrown fields in June and July. The caterpillar hibernates. It feeds on violets.



21. Silver-Bordered Fritillary (*Argynnis myrina*).

A small orange-brown butterfly, with black markings and silver spots on the hind wings beneath. It is common in swampy places and damp meadows. It is on the wing from the latter part of May until early in September, and it is triple-brooded. It flies rather slowly amongst tall grass, when not feeding. When alarmed, it flies only a short distance, and then settles again in the grass. The caterpillar feeds on the violet. Those of the last brood hibernate.



22. Meadow Fritillary (*Argynnis bellona*).

Common in this neighborhood and found together with *Argynnis myrina*, but it is not as abundant as the latter. In general appearance it very much resembles *A. myrina*, from which it differs in the absence of the silver spots on the hind wings beneath. The caterpillar feeds on the violet. The last brood of caterpillars hibernates.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



23. Variegated Fritillary (*Euptoieta claudia*).

Not common in the vicinity of New York. It is found usually in damp, open places where the species of *Argynnis* occur. There are probably two broods here, one in June and July and the other in August and September. The caterpillar feeds on violet, mandrake, passion-flower etc.



24. Pearl Crescent (*Phyciodes tharos*).

Very common from May to the latter part of September or early October. The form which appears in May and June is called *marcia*; it produces the summer form, *morpheus*. It is found in open meadows and fields, and is probably three-brooded in this vicinity. The caterpillar hibernates. It feeds on various kinds of asters.



25. Silver Crescent (*Phyciodes nylteis*).

In general appearance this butterfly resembles *Phyciodes tharos*,

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

especially in color and markings on the upper side; but the under side of the hind wings is very different, being provided with silvery white bands and crescent-shaped spots, which are absent in *P. tharos*. It is also larger than that species. It is somewhat rare in this vicinity. It is on the wing in June and July. The caterpillar lives on different kinds of asters and sunflowers.



26. Black Checker Butterfly (*Melitæa phaëton*).

This pretty black species, with yellow and brick-red spots, is single-brooded, and is not rare in this vicinity, but is local in swampy places. It is found on the wing about the middle of June. In flight the butterfly is slow and sluggish. It alights on leaves, shrubs and grasses and on the ground. The eggs are laid in masses. The young caterpillars spin a web, in which they live until the following spring; after the caterpillars become older they leave the web and live singly on the leaves. Their food is turtle head (*Chelone glabra*), woodbine (*Lonicera*), *Gerardia* etc.



27. Harris's Butterfly (*Melitæa harrisii*).

Very rare in this neighborhood. On the upper surface it looks very much like *Phyciodes nysteis*, but the under surface is quite different. It is on the wing from about the middle of June until August. The caterpillar feeds on the aster.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



28. Violet-Tip (*Polygonia interrogationis*).

Found in glades, gardens and roadsides in the vicinity of woods. It is very fond of sucking the sap which flows from wounded trees, especially maples and oaks, and is attracted by juices of decaying fruits. When at rest on the trunk of a tree, it is very difficult to detect, owing to the brown color of the under side of the wings, which closely resembles that of the bark of the tree or of a withered leaf. It is rather common during warm weather, but difficult to capture. In this vicinity there are three broods, the last one hibernating in the butterfly state. This butterfly has two forms; the hibernating one being known as form *fabricii* and the other as *umbrosa*. *Fabricii* has the upper sides of all the wings orange-brown, with pale and black spots. The form *umbrosa* has the hind wings very dark brown with the markings obliterated. The caterpillar lives on elm, hackberry (*Celtis*), hop and nettle.



29. Hop Merchant or Comma Butterfly (*Polygonia comma*).

A very wary insect with a quick, nervous flight, yet at the same

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

time audacious and pugnacious. It darts recklessly at and about objects in the air, vainly pursuing even a passing bird or dragonfly. They tussle with one another too to such an extent that their wings are almost invariably rubbed and broken after their wrangle. When disturbed, the butterfly takes a zigzag trip over a tree, house-top or fence, often without alighting anywhere, and returns to within a few inches of the old spot. The butterfly usually takes his pastime toward sunset, when only now and then a patch of sunlight remains among the shadows of the trees. The caterpillar is sometimes very destructive to hop vines, and in some localities it is known to growers as the "Hop Merchant," and according as the metallic color on the chrysalis is gold or silver, the price of hops will be high or low. This insect is quite common in the vicinity of New York. The hibernating form of this butterfly is called *harrisii* and the summer form *dryas*. The former differ from the latter in having the hind wings above considerably paler. It feeds on the elm and false-nettle (*Bæhmeria*), as well as on the hop-vine. The butterfly has a silver comma on the under side of the hind wing, hence the name "Comma Butterfly."



30. Marbled Comma Butterfly (*Polytonia faunus*).

Very rare in this vicinity. It is a northern insect, and is common in mountainous districts. It may be recognized easily by the deeply incised and notched outer margins of the wings; and by the under side of the wings, which is beautifully marbled with various shades of brown, from light to dark, and mottled with gray-white. In the light shade there is a row of olive-green spots, followed by a band of the same color within the outer border. The caterpillar lives on birch (*Betula lenta*), willow and wild and cultivated gooseberry.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



31. Gray Comma Butterfly (*Polygonia progne*).

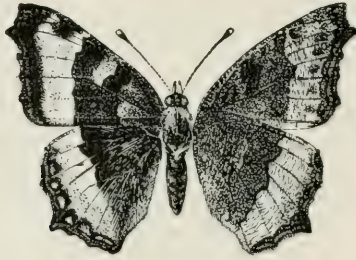
The upper side of the wings is similar to that of *P. comma*, but the under side is very different; these are gray-brown, closely streaked with fine, short lines. It is less common than *P. comma*, but its habits are much the same. It is double-brooded, the first brood appearing in early summer and the second in August and September. The second brood hibernates. The caterpillar feeds on wild and cultivated currant and gooseberry. The figure shows the under side.



32. White J Butterfly (*Polygonia j-album*).

This species is somewhat rare in the vicinity of New York. In the Northern States the butterfly is abundant. It is yellowish, washed with rusty brown; basal half ferruginous, beyond which are large black spots on the fore wings and a white spot near the tip of each wing.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



33. American Tortoise-Shell Butterfly (*Vanessa milberti*).

Somewhat rare in this vicinity, but common throughout the Northern States and Canada, and westward to the Pacific. The eggs are laid in masses, usually on the under side of the leaves of the nettle, and the caterpillars live in swarms.



34. Mourning-Cloak Butterfly (*Vanessa antiopa*).

This species hibernates in the butterfly state in sheltered places. It may be found under stones, stumps of trees, sticking to the rafters of barns or in the crevices of walls, sometimes huddled together in numbers, with the wings doubled together above the back, and apparently lifeless. During the first warm days of April and May the insects crawl forth from their winter quarters and hover about the sappy stumps of recently felled trees. About the middle of July the

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

butterfly becomes scarce, and remains so until the advent of the second brood, in August. The female deposits her eggs in a cluster around a twig near the petiole of a leaf. The caterpillars are gregarious in habits, living together in companies. The first brood of caterpillars appears in June and the second in August. The butterfly is velvety brown with pale yellow border. It is distributed over the entire breadth of the northern hemisphere below the Arctic circle, as far as the thirteenth parallel of latitude. The caterpillar lives on elm, willow, poplar and hackberry (*Celtis*).

A group of this species is on exhibition in the Hall of North American Forestry.



35. Thistle Butterfly (*Pyrameis cardui*).

A cosmopolitan species, very common everywhere. In this vicinity it is doubled-brooded, and the caterpillar lives snugly within a few leaves spun together with silken threads. It lives on the thistle, burdock, sunflower and hollyhock.



36. Painted Beauty or Hunter's Butterfly (*Pyrameis huntera*).

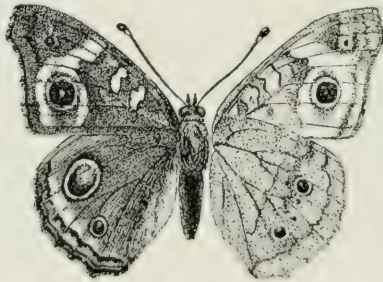
BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

This butterfly may be recognized at once by the white net-like marking and large eye-like spots on the under surface of the hind wings. Common in open fields and along roadsides. It is double-brooded and flies from May to October. The caterpillar feeds on cudweed (*Gnaphalium*) and on wormwood (*Artemisia*); it draws the leaves or flowers together and forms a rude case, within which it lives. The species is found throughout the United States and Canada.



37. Red Admiral (*Pyrameis atalanta*).

Occurs over all North America and in Europe. In this vicinity it is sometimes very common, from the latter part of May until November, and it is double-brooded. The butterfly is brown with a broad red band across each wing. It is found usually along wood paths or in open woods and fields. The caterpillar draws together the edges of a leaf and forms a commodious cavity which shelters it. It feeds on nettle, hop and false nettle (*Bahmeria*).



38. Buckeye Butterfly (*Junonia cavia*).

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

Sometimes rather common in this neighborhood. The species may be recognized easily by the four eye-like spots on the upper side of the wings. The caterpillar feeds on *Gerardia*, plantain and snap-dragon. It is double-brooded. Found throughout the United States and southward.



39. Blue Viceroy (*Limenitis astyanax*).

This butterfly frequents orchards and feeds on fallen fruit. It is black with a bluish lustre, and the hind wings are clouded with bluish shades. It is double-brooded, the first brood appearing in May and June and the second in July and August. The caterpillar feeds on apple, thorn, gooseberry, cherry, plum, huckleberry etc.



40. Brown Viceroy (*Limenitis disippus*).

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

In general appearance this butterfly resembles *Anosia plexippus*, but may be distinguished therefrom at once by its smaller size, scalloped outer borders and the black band across the middle of the hind wings. It is common in this vicinity, where it is found usually along the borders of damp places and in waste fields. It is double-brooded, the first brood appearing in June and the second in July and August. The young caterpillar of the last brood rolls the tip of a leaf around itself, remains thus enclosed all winter and completes its transformation the following spring. It feeds on poplar, willow, apple, plum and oak.

Subfamily SATYRINÆ.

The species of this subfamily are chiefly found in woods, glades and lanes, not often being seen in clearings or open fields. The flight of the butterflies is low, feeble and dancing in style, and is not long sustained. In color they are nearly always brown, with or without eye-like spots, above or below. The caterpillars are furnished with a fork-like process at the end of the body. Their food is different kinds of grasses. The species may be distinguished by the use of the following table:

Synopsis of the Satyrinæ.

Neonympha.

Outer borders rounded.

Wood-brown, with two eye-like spots in yellow rings
on each wing.....*N. eurytus*.

With a row of black spots in a light shade on each wing, *N. canthus*.

Debis.

Outer borders scalloped.

With a row of black spots in a light shade on each
wing.....*D. portlandia*.

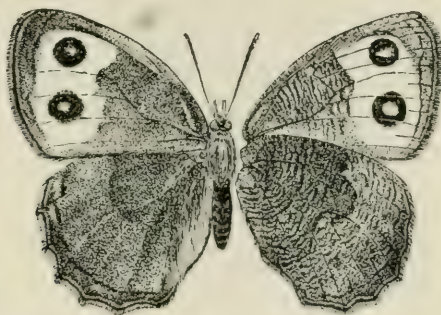
Satyrus.

Wood-brown, with yellow figure-8-like patch on the fore
wings.....*S. alope*.

With yellow patch reduced and darker.....form *maritima*.

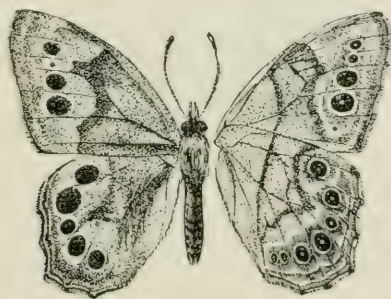
With yellow patch absent.....form *nephele*.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



41. Blue-Eyed Grayling (*Satyrus alope*).

Found plentifully throughout July and August in grassy fields and open woods, especially along the borders of woods where the large trees have been felled and a young growth is appearing. It flies low, and for but a short distance, and rests upon the leaves of bushes or trunks and twigs of dead trees. In the North a form occurs which lacks the yellow marks on the fore wings (var. *nephela*). The caterpillar feeds on grasses.



42. Pearly-Eyed Grayling (*Debis portlandia*).

Generally distributed in this vicinity, but it is local. The flight is somewhat like that of *Neonympha canthus*. It often rests on the trunks of trees, sallies forth at any passing butterfly and retires again to its chosen post of observation. It also flies near the ground, along the edges of woods or in the forests among bushes and trees. Found from the latter part of June to about the first of August, and it is single-brooded. The caterpillar feeds on grasses.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



43. Eyed Grayling (*Neonympha canthus*).

Found in the latter part of June and through July and August, flying in swampy places. Its flight is low, with a slow, jerky motion. It settles here and there among the tall grasses. By beating the grass one may often start the butterflies in numbers. The caterpillar hibernates. It feeds on grasses.



44. Little Wood-Satyr (*Neonympha eurytus*).

Common from the latter part of May until August, in woods and near-by fields, especially fields more or less overgrown with shrubs. It is single-brooded. The caterpillar feeds on grasses.

Subfamily LIBYTHEINÆ.

The species belonging to the subfamily *Libytheinæ* are characterized by their long, beak-like, palpi (mouth parts), and by the males having four feet adapted for walking, while the females have six. They are commonly known as Snout-Butterflies. Only a single species is found in the vicinity of New York.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



45. Snout Butterfly (*Libythea bachmani*).

This species may be recognized easily by its long beak-like palpi, hence the name Snout Butterfly. It is somewhat rare here, though it sometimes appears in numbers. It flies during May, July, August and early September, and is two- or three-brooded. The caterpillar feeds on hackberry (*Celtis*).

Family LYCÆNIDÆ.

These are small butterflies, with or without fine, short, hair-like tails on the hind wings. They have six legs adapted for walking. They are commonly called Blues and Hair-Streaks. The caterpillars usually live in flower-heads of various kinds of plants, feeding on the tender parts of the leaves only when compelled to do so. They are more or less oblong oval or oval, with the head retractile into the first segment, and have a ridge along the back. The chrysalids are short, fastened at the anal extremity, and have a loop of silk around the body, much as do the *Papilionidæ*. They may be separated as follows:

Synopsis of the Lycæninae.

Thecla.

Hind wings with tails.

- Slate-gray, with an orange spot at the anal angle of hind wing.....*T. melinus*.
- Sepia-brown, with a double, broken, white transverse band on both wings beneath:.....*T. calanus*.
- Sepia-brown, with four irregular, wavy white lines across the upper wing beneath.....*T. strigosa*.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

- Thickly scaled with green on the under side, with wavy
white and brown transverse bands. *T. damon*.
- Hind wings strongly toothed or notched.
- Outer half of hind wings heavily overlaid with whitish
scales beneath. *T. irus*.
- Hind wings ferruginous with zig-zag transverse lines
beneath. *T. niphon*.
- Hind wings not toothed or notched.
- Under side of hind wings with outer half ferruginous. . *T. augustus*.
- Hind wings with outline evenly rounded (female); hind angle
produced (male).
- Under side of hind wing with an outer row of large
orange spots. *T. titus*.

Feniseca.

- Wings ochraceous, with black border. .
- Under side of hind wings with many whitish rings. . *F. tarquinus*.

Chrysophanus.

- Small size, glossy orange-red.
- Hind wing brownish-gray with black spots beneath. *C. hypophlæas*.
- Large size, copper-brown with black spots.
- Under side of wings whitish, with black spots. *C. thoë*.

Lycæna.

- Hind wings with a thread-like tail. Color, blue.
- Under side of hind wings with two orange spots. . . . *L. comyntas*.
- Hind wings without thread-like tail. Color, blue.
- With terminal row of orange spots on under side of hind
wings. *L. scudderii*.
- Without orange spots on hind wings beneath. . . . *L. pseudargiolus*.
- Smaller than *pseudargiolus*. form *neglecta*.
- Spots on under side running together. form *lucia*.
- Spots on basal area of hind wings not running together,
form *marginata*.
- Terminal rows and basal spots on hind wing promi-
nent, not running together. form *violacea*.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



46. Gray Hair-Streak (*Thecla melinus*).

A small slate-colored species, with an orange patch, enclosing a black spot, near the anal angle of the hind wings. It is double-brooded, and flies in open woods and gardens during May, June, July and August. The caterpillar lives on the heads of the common hop-vine, and also on the bean.



47. Banded Hair-Streak (*Thecla calamus*).

Not common in the vicinity during June, July and August, in woods and about shrubbery. The butterfly is sepia-brown above, and on the under surface, with two double white stripes on each of the fore and hind wings. It is single-brooded. The caterpillar feeds on oak, chestnut, hickory and walnut.



48. Striped Hair-Streak (*Thecla strigosa*).

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

Very rare in this vicinity. It is closely allied to *T. calanus*, but differs in the position and number of white lines on the under side. The butterfly appears to be local, and is rarely found away from thickets. It flies early in July, and is rarely found on the wing after the first of August. The eggs are laid in July and remain unhatched until spring. The caterpillar feeds on oak, holly, thorn, plum and apple.



49. Hoary Hair-Streak (*Thecla irus*).

Rather common locally in this neighborhood, especially in pine woods and open places near where huckleberries grow. The caterpillar is said to feed on these plants. It lives on the wild plum also. The butterfly appears during the latter part of April, and is on the wing until about June.



50. Coral Hair-Streak (*Thecla titus*).

The butterfly frequents flowers in open sunny places near thickets and woods. It is found in July and early in August, and is single-brooded. In this vicinity it is considered rare, but occasionally it has been found in considerable numbers. Its color is sepia-brown, with a row of coral-red spots along the outer border on the under sides of the hind wings. The caterpillar lives on plum and wild cherry.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



51. Green Hair-Streak (*Thecla damon*).

Found on the wing in May and June, and again in July and August. It occurs only in localities where cedar trees grow, this tree furnishing the food of the caterpillar. The butterfly when disturbed flies for a short distance and suddenly drops to the ground, folding its wings. Owing to the green color on the under side of the wings, it is quite difficult to detect the insect in the grass.



52. Brown Elfin (*Thecla augustus*).

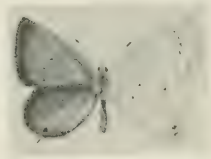
In color on the upper surface this insect is like that of *T. irus*, but it differs greatly from that species as to the under side of the hind wings, which have the basal half deep brown and the outer half rusty brown, with a row of minute dark spots. It is found in pine woods in April and May.



53. Pine Hair-Streak (*Thecla niphon*).

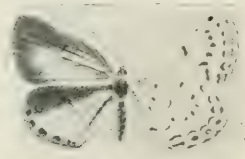
Rare in this vicinity. Found in pine woods, in April and early in May. It is single-brooded. The caterpillar feeds on pine.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



54. Tailed Blue Butterfly (*Lycæna comyntas*).

A small blue butterfly common everywhere, in meadows, clover fields and roadsides from May to September. It is three-brooded, and the caterpillar feeds on the flower-heads and tender leaves of clover, bush-clover (*Lespedeza*) and tick-trefoil (*Desmodium*).



55. Scudder's Blue Butterfly (*Lycæna scudderii*).

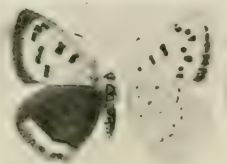
Very rare in this neighborhood. Only a few specimens have been taken. It is double-brooded, the first brood appearing in May and June, and the second in July and August. The caterpillar feeds on lupines.



56. Spring Azure Butterfly (*Lycæna pseudargiolus*).

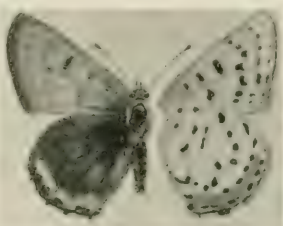
A very common species found in open sunny places, especially in woods. There are five forms of this butterfly in this vicinity. The forms *lucia*, *marginata* and *violacea* are found in April and early in May. The forms *neglecta* and *pseudargiolus* are found in the summer until September. The caterpillar lives in the flower-heads and tender leaves of various kinds of plants.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



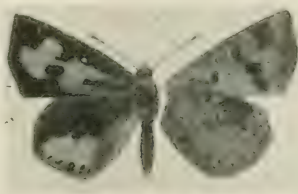
57. American Copper Butterfly (*Chrysophanus hypophlæas*).

Very common in open, sunny fields and meadows, from May to October. Three-brooded in this vicinity. The caterpillar lives on sorrel (*Rumex*).



58. Bronze Copper Butterfly (*Chrysophanus thoë*).

This butterfly is double-brooded, and is not common in this vicinity. It is found in swampy places. The first brood appears in June or early in July, and the second from the middle of August to the middle of September. The caterpillar feeds on smart-weed (*Polygonum*) and sorrel (*Rumex*).



59. The Wanderer (*Feniseca tarquinius*).

Somewhat rare and local in this neighborhood. It is usually found where alders grow. The caterpillar feeds on plant-lice, which live in masses and are covered with thick white waxy excretions. The caterpillar particularly affects the species (*Schizoneura tessellata*)

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

which occurs on the alder. It is three-brooded, the first brood appearing from the latter part of May to the middle of June; the second early in July, continuing to fly until the early part of August; the third brood appears from the middle of August to the end of September.

Family HESPERIDÆ.

The members of this family are known as Hesperids or Skippers, the latter name having been applied on account of the peculiar flight of the species. The flight is very rapid, varied and interrupted, terminating suddenly after a short career and suddenly resumed. It is hurried and intermittent, never steady or sailing like that of the other groups. The butterflies almost invariably delight in the hottest sunshine, and generally frequent open meadows. They may be known readily by their antennæ, which are abruptly hooked at the tip. The caterpillars have between the head and first segment a distinct neck which gives them a very characteristic appearance.

Synopsis of the Hesperidæ.

Ancyloxypha.

Fore wings blackish, washed with orange, ochraceous.

Under side of hind wings clear orange, ochraceous. . . *A. numitor*.

Pamphila.¹

With a short black bar on fore wings at end of cell.

Under side of hind wings with a large yellow patch in
the middle. *P. hobomok*.

Under side of hind wings almost entirely yellow, brown
at base. *P. zabulon*.

¹ It is very difficult to give a satisfactory synopsis of the genus *Pamphila*, as the sexes of each species differ in markings on the upper side, especially on the fore wings. The males of some species are provided with a stigma, which is more or less distinct or wanting entirely; while in the females it is always absent. The markings and coloration of the under side of the hind wings, however, are constant in both sexes, and by means of this they may be readily united, or the species separated. The stigma is a velvety mark on the fore wings.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

- Under side of hind wings clear yellow. *P. logan*.
- With an oblique velvety black stigma on fore wings (male).
 - Under side of hind wings yellowish with an indistinct spot-like band in the middle. *P. sassacus*.
 - Under side of hind wings rusty brown with a conspicuous row of white or pale yellow spots. *P. leonardus*.
 - Under side of hind wings yellowish, with black spots. . . *P. phylæus*.
 - Under side of hind wings with a distinct, yellow, large spot-like band across the middle connected with a patch at the base. *P. peckius*.
 - Under side of hind wings with a more or less distinct, yellow, spot-like band in middle, not connected with the patch near base. *P. mystic*.
 - Under side of hind wings thickly scaled with olivaceous. *P. cernes*.
- With stigma on fore wings indistinct.
 - Under side of hind wings vinous, with a few very indistinct, paler spots in the middle. *P. verna*.
 - Under side of hind wings lighter brown than upper. *P. metacomet*.
 - Underside of hind wings rusty brown, with violet patches, *P. accius*.
- With stigma on the fore wings curved.
 - Under side of hind wings dirty yellowish, with a lighter shade in the middle. *P. huron*.
- Stigma on fore wings pinched in the middle.
 - Under side of hind wings orange-brown, with a few yellow spots in the middle. *P. pontiac*.
- With stigma connected with an indistinct, narrow basal streak.
 - Under side of hind wings ochraceous, with a row of lighter spots in the middle. *P. manataqua*.
- Stigma broken in the middle.
 - Under side of hind wings rusty brown, with a row of lighter spots in the middle, or olive-brown. *P. otho* var. *egeremet*.
- Stigma absent.
 - Under side of hind wings with a large, bright yellow patch in the middle. *P. massasoit*.
 - Both sexes similar; under side of hind wings dirty yellowish-brown, with a lighter patch in the middle. *P. viator*.
- Stigma minute, almost invisible.
 - Under side of hind wings washed with gray. *P. hianna*.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

Fore wings dark brown, with bronzy lustre and two semi-transparent spots in the middle.

Under side of hind wings paler than the upper, with a lighter reflection.....*P. ocola*.

Fore wings brown without spots.

Hind wings with white fringes.....*P. fusca*.

Pyrgus.

Black, with transverse rows of white spots on the fore wings,

P. tessellatus.

Black, with one row of transverse, white spots.....*P. centaureæ*.

Pholisora.

Sooty black, with an irregular curved row of small white dots.....*P. catullus*.

Nisoniades.

Deep brown, fore wings thickly scaled with gray between the outer bands.....*N. brizo*.

Smaller, with the scales more regularly distributed over the fore wings.....*N. icelus*.

Small, with white spots on the outer band.....*N. lucilius*.

Larger, marked like *lucilius* but less distinctly.....*N. persius*.

With bands on fore wings heavy and very conspicuous, white spots very indistinct.....*N. martialis*.

Large species, allied to *martialis*, but with heavy white spots.....*N. juvenalis*.

Eudamus.

Chocolate-brown, with an amber-yellow patch on fore wing.

Under side of hind wings with a large silvery-white spot in the middle.....*E. tityrus*.

Under side of hind wings broadly smeared with white along the outer border.....*E. lycidas*.

Under side of hind wings with two transverse bands.

Fore wings with small white spots.....*E. pylades*.

Fore wings with large white spots.....*E. bathyllus*.

Fore wings with a broad, oblique, amber-yellow band.

Outer border of hind wings scaled with gray.....*E. cellus*.

Hind wings with long, tail-like appendages.

Wings and body above with long green hairs.....*E. proteus*.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



60. Small Skipper (*Ancyloxypha numitor*).

A small orange-brown species with black borders. Common in marshy grassy places in June, July, August and September, and is three-brooded. The caterpillar feeds on grasses.



61. Massasoit Skipper (*Pamphila massasoit*).

Flies in swampy places in June and July, and is sometimes common locally. The caterpillar feeds on grasses.



62. Logan Skipper (*Pamphila logan*).

Rare in this vicinity, but common in the Southern States. Found from June until September. The caterpillar feeds on grasses.

63. Zabulon Skipper (*Pamphila zabulon*).

Differs from *P. hobomok* by having the under side of the hind wings almost entirely bright lemon-yellow with the base brown. The female is always brown and resembles var. *pocahontas*.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



64. Hobomok Skipper (*Pamphila hobomok*).

Rather common along the edges of woods and sunny wood paths, during the latter part of May and throughout June, disappearing early in July. It is single-brooded. It flies close to the ground, and settles on leaves of plants when at rest. In the female a form occurs (var. *pocahontas*) which is brown instead of yellow. The caterpillar feeds on grasses.



65. Leonard's Skipper (*Pamphila leonardus*).

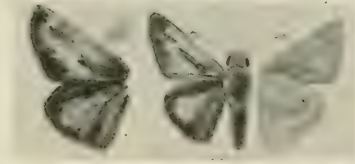
Rather scarce in this neighborhood. Single-brooded. It is on the wing during the latter part of August until early in September. The caterpillar feeds on grasses.



66. Huron Skipper (*Pamphila huron*).

Somewhat rare, but common farther south. It is single-brooded. The caterpillar feeds on grasses.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



67. Sassacus Skipper (*Pamphila sassacus*).

Not common in this vicinity in May and June. It occurs along roadsides and borders of woods. The caterpillar feeds on grasses.



68. Mystic Skipper (*Pamphila mystic*).

Rather common locally. Found in open grassy meadows late in May and throughout June, and again in August and early September. The caterpillar feeds on grasses.



69. Common Skipper (*Pamphila cernes*).

Very common everywhere from May to September in grassy meadows. It flies usually in company with *P. peckius*. Double-brooded. The caterpillar feeds on grasses.

70. Brown Skipper (*Pamphila fusca*).

A small, uniformly brown species with the fringes on the hind wings whitish. It is rare in this vicinity, and is found in sandy places. In the Southern States it is quite abundant.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



71. Egeremet Skipper (*Pamphila otho*, var. *egeremet*).

Sometimes rather abundant locally in June and July. The form *otho* is common in the Southern States and does not occur in this vicinity. The caterpillar feeds on grasses.



72. Metacommet Skipper (*Pamphila metacommet*).

Not common. Found in June and July. It frequents flowers in fields and open ground. Single-brooded. The caterpillar feeds on grasses.



73. Hianna Skipper (*Pamphila hianna*).

Appears during the latter part of May, and is on the wing until about the middle of June. A brown butterfly with a few white dots on the fore wings, and heavily shaded with gray on the under sides of the wings. Very rare in this vicinity.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



74. Peck's Skipper (*Pamphila peckius*).

Found everywhere in meadows, and is one of the most common species of Hesperids in this vicinity. It is double-brooded, the first brood appearing from the latter part of May to the middle of July, and the second brood in August and September. The caterpillar feeds on grasses.



75. Pontiac Skipper (*Pamphila pontiac*).

Not common. Found in June and July. It is single-brooded. The caterpillar feeds on grasses.



76. Ocola Skipper (*Pamphila ocola*).

A dark brown species, with slight bronzy lustre. There is a semi-transparent spot on the fore wings at the end of the cell, and a small dot a little beyond. Sometimes traces of a third spot are found beneath the large one. Very rare in this vicinity, but common southward.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



77. Spotted Skipper (*Pamphila phylæus*).

Rare in this vicinity, but it is a common insect in the Southern States. The caterpillar feeds on grasses.



78. Clouded Skipper (*Pamphila accius*).

Very rare in this vicinity, but a common insect in the Southern States. It is deep brown, with violet shades on the under surface of the hind wings. Found in June and July.



79. Glass-Spotted Skipper (*Pamphila verna*).

Common, but not abundant, in June and July. Flies in grassy meadows. It is single-brooded. The caterpillar feeds on grasses.



80. Manataaqua Skipper (*Pamphila manataaqua*).

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

Found in June, July and August. It is single-brooded. The butterfly in general appearance looks very much like *P. cernes*, but it is considerably larger, and on the under side of the hind wings there is a row of pale spots. The caterpillar feeds on grasses.



81. Broad-Winged Skipper (*Pamphila viator*).

Scarce in this neighborhood. It is single-brooded, and is on the wing in June.



82. Checkered Hesperid (*Pyrgus tessellatus*).

Not common in this vicinity. Appears to be triple-brooded, being found from the latter part of April until October. The caterpillar feeds on mallow, *Sida*, Indian mallow (*Abutilon*) and marsh-mallow (*Althæa*).



83. Grizzled Hesperid (*Pyrgus centaureæ*).

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY

Common locally, and is on the wing during the latter part of April and until about the middle of August. The butterfly has a remarkable distribution. It is found in Lapland, Scandinavia, Labrador, and from the Canadian hills and Vermont to North Carolina. The early stages are unknown.



84. Sooty Skipper (*Pholisora catullus*).

Very common everywhere in open fields, gardens, roadsides and meadows. It is double-brooded, and flies from May until September. The caterpillar feeds on goosefoot (*Chenopodium*); it draws the leaves together with silken threads, making a case within which it lives.



85. *Nisoniades brizo*.¹

Found in May and June in moist, shady woods and along wood paths. The butterfly flies swiftly and near the ground. It is single-brooded. The caterpillar feeds on oak.

86. *Nisoniades lucilius*.

Rather common locally in open woods and roadsides, in May and June. Single-brooded. The caterpillar feeds on wild columbine (*Aquilegia*).

¹ The butterflies belonging to the genus *Nisoniades* are known commonly as "Dusky-wings."

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



87. *Nisoniades icelus*.

Not rare in open woods, and especially along wood paths. It flies during May and June. It is single-brooded. The caterpillar feeds on aspen, willow and witch-hazel.



88. *Nisoniades persius*.

Allied to *N. lucilius*, but is larger, with the markings less distinct. It is quite common locally, in woods and along shady roadsides. It is single-brooded and flies during May and June. The caterpillar feeds on willow and poplar.



89. *Nisoniades martialis*.

Quite scarce in this vicinity, and found in localities similar to those in which are found other species of *Nisoniades*, in May and June, and again in July and August. The food-plant is said to be wild indigo (*Indigofera carolina*).

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



90. *Nisoniades juvenalis*.

A common species found from May until the end of August, especially in oak woods or roads near by. It is double-brooded.



91. Golden-Banded Hesperid (*Eudamus cellus*).

Exceedingly rare in this neighborhood, but more common in the Southern States and Mexico.



92. Northern Cloudy-Wing (*Eudamus pylades*).

Common in open woods and fields near by; it flies rapidly, close to the ground, and it is single-brooded. Found from the latter part of May to the middle of August. The caterpillar feeds on clover and bush-clover (*Lespedeza*).

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



93. Southern Cloudy-Wing (*Eudamus bathyllus*).

Found during June and July in the same places as *E. pylades*, but it is less common. It is single-brooded. The caterpillar feeds on wild bean, bush-clover (*Lespedeza*), butterfly-pea (*Eutrosema virginianum*), hoary pea (*Tephrosia*) and probably other plants belonging to the family *Leguminosæ* (Pulse family).



94. Silver-Spotted Hesperid (*Eudamus tityrus*).

Common everywhere in this vicinity, from May to September. Double-brooded. The caterpillar feeds on locust, acacia, wistaria, milk-vetch (*Astragalus*), tick-trefoil (*Desmodium*) and wild bean (*Apios*).

A watercolor painting showing a branch of a locust-tree with male and female butterflies, the caterpillar and the chrysalid of the Silver-Spotted, or Locust, Hesperid and illustrating the effect of the insect on the leaf is on exhibition in the Hall of North American Forestry.

BUTTERFLIES OF THE VICINITY OF NEW YORK CITY



95. Hoary Cloudy-Wing (*Eudamus lycidas*).

Not common. It may be found in June and July in open places and edges of woods. The flight of the butterfly is swift, and it darts off very rapidly when disturbed. Besides alighting on flowers, it has the habit of sitting on the tips of dead branches of bushes and young trees. It is single-brooded. The caterpillar feeds on tick-trefoil (*Desmodium*) and other *Leguminosæ*.



96. Long-Tailed Hesperid (*Eudamus proteus*).

Exceedingly rare in this neighborhood, but very common in the Southern States. The caterpillar feeds on wild bean (*Phaseolus*), butterfly-pea (*Clitoria*), wistaria, tick-trefoil (*Desmodium*) and other allied plants

The American Museum Journal

VOL. II.

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No. 6.

NEW ETHNIC GROUPS.



THE life-size ethnic groups illustrating the appearance and culture of the Eskimo, the Indians of the Northwest coast, the Indians of the Plains, etc., are being supplemented by a new series of groups, in miniature but representing more complex scenes. One of these, showing a village of the Thompson River (B. C.) Indians, with the people pursuing various occupations, was pictured in this JOURNAL, Vol. I, No. 10, p. 148. Another of the series shows some Eskimo, their snow dwellings, dogs, sleds, etc. The latest, recently put on exhibition in the Hall of North American Ethnology, represents the Sun Dance of the Arapaho Indians. This is quite an elaborate group, including 200 figures, each about four inches high. It shows a great circular open framework lodge, within which the dancers are arranged in a semi-circle, the people crowding around outside the lodge. By means of these small groups scenes of much greater scope than would be possible with life-size groups can be represented accurately and effectively.

THE DEVELOPMENT OF THE AMERICAN MUSEUM OF NATURAL HISTORY.

(Continued.)



THE DEPARTMENT OF ANTHROPOLOGY.—Very soon after the foundation of the Museum, archaeological collections from various parts of America began to come in. Their number increased rapidly, and led to the establishment of a special department of the Museum, which was put in charge of Professor Albert S.

THE AMERICAN MUSEUM JOURNAL

Bickmore. A number of important collections were purchased, which formed the nucleus of the Department. Among these, the Morgan collection from the Somme Valley, France, the Davis collection from the mounds of Ohio, the Squier collection of antiquities of South America and Central America and the Jones collection from Georgia are particularly worthy of mention. Some of these collections are of historical importance.

No systematic development of the Department was attempted during these years, although a considerable amount of archaeological and ethnological material continued to be received. During this period the primary interest was directed rather to the remains of the ancient inhabitants of our continent than to a representation of the customs of existing tribes; nevertheless a considerable amount of material from North America, as well as from South America, began to accumulate.

One of the most important donations to this Department during this period was that of a large collection from British Columbia, made by Dr. J. W. Powell of Victoria, B. C., and presented to the Museum in 1880 by Mr. Heber R. Bishop. About the same time Mr. Appleton Sturgis deposited a large collection of objects from the islands of the Pacific Ocean in the Museum, which later on was purchased by the Trustees. For a long time these two collections formed the principal ethnological exhibits of the Department. The material contained in the Bishop collection has been most admirably supplemented by a collection from Alaska, which the Trustees purchased in 1887 from Lieut. G. T. Emmons, who had been collecting ethnological specimens during a long-continued stay in that region. In 1894 this collection was still further improved by the purchase of a second collection made by Lieutenant Emmons. Mr. Henry Villard engaged Dr. Carl Lumholtz to carry on for the Museum researches in northern Mexico. Later on this work was also continued at the expense of the Museum until its completion in 1898.

While thus the ethnological collections of the Museum were increasing, the growth of the archaeological material also continued. In 1880 Mr. James Terry brought to the Museum his

THE AMERICAN MUSEUM JOURNAL

large and varied collection, which covers almost the whole of the North American continent, and which is particularly rich in objects from California and Oregon. In 1891 this collection was purchased by the Trustees. Another valuable archæological collection which was brought to the Museum about this time was that of Mr. Andrew E. Douglass. It contains a great number of exquisite specimens, and is arranged so as to show synoptically the various types occurring in North America. Shortly before his death in 1901, Mr. Douglass donated his entire collection to the Museum.

The growth of the Department made it necessary to place it under the charge of a special curator. For a number of years Professor Bickmore had combined the direction of the Department with numerous other duties connected with the Museum. After a few years of experiments the Department of Archæology and Ethnology was established under the curatorship of Mr. James Terry, who retained this position until 1894. In January, 1894, Mr. Marshall H. Saville entered on the duties of Assistant Curator, and later in the same year Professor F. W. Putnam was appointed to the curatorship. With this time commenced the systematic development of the Department by means of expeditions organized for the purposes of collecting and research. The two expeditions which had been entered upon under the curatorship of Mr. Terry were continued, but numerous other enterprises, which were decided upon according to the needs of the Department, were organized.

Owing to the peculiar manner in which the Department had grown, the collections were very unsystematic. From some regions excellent and exhaustive material had been received, while other districts were not represented at all. Since the Museum had never undertaken any archæological research, there was not a collection that represented the archæology of any definite area fully. For this reason it was one of the first undertakings of Professor Putnam to send collectors to carry on researches in a few typical fields. Mr. Harlan I. Smith explored some of the stone graves of Kentucky, while Dr. George A. Dorsey and Mr. C. L. Metz carried on similar work in Ohio.

THE AMERICAN MUSEUM JOURNAL

It seemed of especial interest to investigate the archæology of New York State, more particularly in the vicinity of New York City. Work in this region was carried on for a number of years by Mr. M. H. Saville, Mr. George H. Pepper, Mr. Harlan I. Smith, and of late years by Mr. M. Raymond Harrington. Much of the expense of these undertakings has been defrayed by friends of the institution.

The interesting gravels of Trenton, N. J., in which artifacts have been found to considerable depths, seemed to require further examination, in order to determine as accurately as possible the distribution of such objects in the various layers of the gravel. This work, which has been carried on by Mr. Ernest Volk, has continued from 1893 up to the present time, and has yielded very accurate information on this much-discussed question. The painstaking investigations of Mr. Volk have been supported by the liberality of Dr. F. E. Hyde and the Duke of Loubat.

One of the most important inquiries organized by the Museum is the archæological investigation of the ruins of the Southwest. The Museum was enabled to undertake this work by the enthusiasm and the liberality of Mr. B. Talbot B. Hyde and Mr. Frederick E. Hyde, Jr., who organized an expedition to the Southwest in 1894. From 1895 on, the archæological work of the expedition has been carried on principally by Mr. George H. Pepper. The specimens obtained through these researches are of very great interest, and the scientific results are of considerable importance.

Investigations in Mexico and Central America were also taken up with great vigor. The Museum was enabled to carry on extensive work in this district, particularly through the liberality of the Duke of Loubat, who has done so much to advance our knowledge of Central America and Mexico. He donated to the Museum a complete collection of all the existing reproductions of Central American sculptures, so that the student finds in this Museum unequalled opportunity for the study of Central American antiquities. The Duke of Loubat also sent the well-known Americanist, Prof. Eduard Seler, to Mexico in the joint

THE AMERICAN MUSEUM JOURNAL

interests of the American Museum of Natural History and the Royal Ethnographical Museum of Berlin.

Later on, Mr. Marshall H. Saville succeeded in obtaining permission from the Mexican Government for the American Museum of Natural History to conduct archæological researches in Mexico. Based on this agreement, a number of expeditions have been undertaken, which again have been largely supported by the Duke of Loubat. Mr. Saville has carried on researches in the states of Chiapas and Oaxaca, which have yielded results of considerable scientific interest, and which have added materially to the treasures of the Department.

Dr. Lumholtz's expedition, before mentioned, has yielded a large amount of archæological material also from the northwestern parts of Mexico, so that now the Mexican archæological collections of the Department occupy a prominent place among the museums of our time.

In 1891 Mr. Henry Villard sent Dr. Adolph Bandelier to South America to make collections and investigations for the American Museum. This work was continued until 1894 at the expense of Mr. Villard, and after that time at the expense of the Museum. The investigations were completed in 1900. These researches of Dr. Bandelier have brought to the Museum a vast amount of valuable material, accompanied by accurate notes made by the collector, whose great knowledge of the early history of America makes him particularly competent to deal with these subjects.

At the time when Professor Putnam was appointed Curator, the ethnological collections of the Department, and those relating to physical anthropology, were very unevenly developed. While some regions were very well represented, collections from others were very deficient. In 1895 Dr. Franz Boas was appointed Assistant Curator in the Department, to take charge of these collections. A number of expeditions which had been organized previously brought in a considerable amount of ethnological material. Dr. Lumholtz sent from northwestern Mexico material of very great value. The culture of the people whom he investigated showed certain resemblances to the ancient culture

THE AMERICAN MUSEUM JOURNAL

of Mexico, as well as to that of the Pueblos. On a renewed expedition in 1898 he added considerably to the material previously accumulated. On this expedition he was accompanied by Dr. Aleš Hrdlička, who devoted his energies to a study of the physical types of the Indians of northern Mexico, and who, during this and subsequent years, has contributed very largely to the growth of the collections relating to physical anthropology. His investigations were carried out first in connection with Dr. Lumholtz's work in Mexico, and later in connection with the Hyde Southwestern expedition.

In 1895 Lieut. R. E. Peary returned from one of his expeditions to North Greenland. Since on this expedition he was materially assisted by President Morris K. Jesup, the ethnological material collected from the Eskimo of Smith Sound by him became the property of the Museum.

In 1897 President Morris K. Jesup provided the means for a thorough investigation of the tribes of the North Pacific coasts of America and Asia. This undertaking, which was organized under the name of "The Jesup North Pacific Expedition," has continued for six years, from 1897 to 1902. During this period a considerable number of expeditions have been sent into the field; and the tribes of the North Pacific coast, beginning in the west with the Amur river, in Siberia, including the various native tribes between the Sea of Okhotsk and the Arctic sea, and the peoples of Alaska, British Columbia and Washington, were investigated. The collections brought home by the investigators, eleven in number, make up a very considerable portion of the ethnological collections of the Department. The scientific results obtained by the expedition are extensive, and important contributions to our knowledge of the tribes of this area have been made by the various sections of the expedition.

Very little work had been done by the Museum on the Indian tribes of the Plains and of California. Investigation in these regions was provided for in 1899 by the liberality of Mrs. Morris K. Jesup, Mr. Henry Villard and Mr. C. P. Huntington. This work has been continued from year to year, partly through the support of the patrons of science named, partly by the Trustees

THE AMERICAN MUSEUM JOURNAL

and partly by Mr. Archer M. Huntington and Mrs. C. P. Huntington. Attention has been paid particularly to securing information regarding the rapidly vanishing tribes, and to securing for the Museum specimens illustrating their culture. This work is still in progress, and needs vigorous prosecution. The principal collections obtained through these researches are from the Eskimo of Baffin Bay and Hudson Bay, from various tribes of the Plains, and from California and Oregon.

The political events of the last few years seemed to make it desirable that the Museum should expand its activity beyond the limits of our continent. It seemed one of the necessary educational functions of the Museum to show to the public the forms of culture developed in foreign continents. This led to the establishment of a Chinese section, the means for which were given by an anonymous donor. The work of making these collections has been intrusted to Dr. Berthold Laufer, who is spending a number of years in China, collecting for the Museum.

The Department is carrying on its work in many directions. It is constantly adding to its collections, and is contributing to the advancement of science by numerous publications based on its expeditions. The work that the Department has to do is extensive and at the same time most urgent, because the native races and their remains are disappearing rapidly before the advance of our civilization.

F. B.

THE expeditions for fossil horses on the William C. Whitney fund, which were so successful last season, will be continued this year in eastern Colorado, following the unexplored portions of the Protohippus Beds in the hopes of securing a complete skeleton of this usually fragmentary animal. At the same time a vigorous search will be made in western Nebraska for the same fossil species of horse, in the locality where Professor Leidy first discovered this animal. An expedition for Cretaceous Dinosaurs will go to either Wyoming or Montana and the famous Bone Cabin Quarry in central Wyoming will be further explored for large Jurassic Dinosaurs.

The American Museum Journal

VOL. II.

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No. 7.



THE sessions of the International Congress of Americanists are to be held in the halls of the Museum October 20 to 25, inclusive, and elaborate preparations have been made to insure the complete success of the convention, especially since this will be the first time that the meetings of this association have been held in the United States. A brief history of the inception and growth of the Congress and an extended notice of the meetings to be held this month in the Museum were published in the JOURNAL for March last. The present number contains two articles which will be of especial interest to the members of the Congress and to others interested in anthropology. These are the statements regarding the extensive ethnological work being carried on by the Museum, under the supervision of Professor Boas, and a summary account of the recent expedition by Dr. Hrdlička, which lasted seven months and continued the field work of the investigations which he has been carrying on for several years among the Indian tribes of the Southwestern States and Mexico. Investigations of particular moment to the Americanists have been carried on in Mexico by Mr. M. H. Saville and will be made the subject of special communications to the Congress. A report of the proceedings of the Congress may be expected in the December number of the JOURNAL.

The present issue of the JOURNAL is not accompanied by a supplement, but it contains more than double the usual number of pages and in addition to the anthropological articles just mentioned is devoted to reports from some of the expeditions sent out by or under the auspices of the Museum during the past summer season. Other reports may be expected in future numbers.



LA SOUFRIÈRE, ST. VINCENT.
From photograph by E. O. Hovey, taken May 24, 1902.

THE AMERICAN MUSEUM JOURNAL

A VISIT TO MARTINIQUE AND ST. VINCENT AFTER THE GREAT ERUPTIONS OF MAY AND JUNE, 1902.



WHEN, early in May, the news came that the supposedly extinct volcanoes of Mt. Pelée, on the island of Martinique, and of La Soufrière, on the island of St. Vincent, had suddenly burst into violent eruption, destroying thousands of human lives and millions of dollars' worth of property, Mr. Morris K. Jesup, President of the American Museum of Natural History, perceived the scientific value of the opportunity thus offered for the study of vulcanology, and it was decided immediately to send the writer to the islands as the representative of the Museum to investigate the phenomena of the eruptions. I left New York on the United States cruiser *Dixie* May 14, and arrived in Martinique May 21. At this time two days were devoted to the study of St. Pierre and its desolation, and then I went on with the *Dixie* to St. Vincent. A man-of-war is a part of the country to which she belongs, so that I felt as if my home-land were going away from me, when the *Dixie* sailed from Kingstown May 29, leaving me to continue my investigations there before returning to Martinique. I wish here to express my appreciation of the hospitality of Captain R. M. Berry, U. S. N., and other officers of the cruiser.

Nearly three weeks were devoted to the study of the Soufrière on St. Vincent, excursions and investigations being made from both sides of the island, and my work was greatly facilitated by Mr. F. W. Griffith, government clerk, acting under general instructions from Sir Robert Llewellyn, C. M. G., Governor of the colony, and by T. M. MacDonald, Esq., of Wallilabou, and James E. Richards, Esq., of Kingstown. My colleagues, Dr. T. A. Jaggar, Jr., and Mr. George Carroll Curtis, and I, accompanied by Mr. MacDonald, were the first persons to attempt the ascent of the Soufrière after the great eruptions. We accomplished our task on a perfect day, May 31, and were well rewarded for our effort and risk. We found the crater to be a vast pit about nine-tenths of a mile wide and 2400 feet deep below the highest point



MT. PELEE AND THE RUINS OF ST. PIERRE, MARTINIQUE. PLACE BERTIN IN THE FOREGROUND.
From photograph by E. O. Hovey, taken June 14, 1902.

THE AMERICAN MUSEUM JOURNAL

of the rim. The old crater lake, for which the volcano had been famous before the eruption, had disappeared, of course, but a small boiling lake had formed in the bottom of the great cauldron, since the last outburst. Ever since the great eruption of 1812, La Soufrière had had two craters in its top, a small one having been formed at that time just outside the large old pit on its northeast side. Did this, so-called, "New" crater participate in the May eruptions? This important question was decided June 9 when I stood upon its edge in company with Mr. Curtis and a negro guide. The condition of the interior, of the saddle between it and the large crater and of the rim itself showed that the small, or 1812, crater had felt no sympathy with the large crater in the eruption of May of the present year. This eruption had returned to the outlet made use of in the eruptions of 1718 and before.

After an all too short stay upon St. Vincent, Mr. Curtis and I left on June 10 for Martinique. On our way north we chartered in St. Lucia a sloop of eleven tons register, which we kept with us during our stay near the scene of action of Mt. Pelée. We passed through St. Pierre several times and traversed the adjoining hills, or "mornes," and the slopes of the volcano in several directions. Four times (June 18, 20, 24 and 26) we stood upon the rim of the great active crater and looked upon a scene of wild and terrifying grandeur within and without the throat and gorge from which had issued the steam, gases, dust and stones that carried death and destruction to the beautiful city of St. Pierre and its inhabitants, lying in a *cul-de-sac* in the path of the volcanic tornado-blast, as helpless as an animal in a trap. We were the first to ascend the mountain from the west since the eruptions began on May 8; and we followed the plateau and ridge between the Sèche and Blanche rivers on June 24 and 26. Our days were not devoid of exciting and even dangerous experiences, but discussion of such features must be left to another time.

The devastation wrought by the eruption cannot be appreciated from a verbal description, and even photographs do not convey an adequate idea of what has happened, unless one is



"BREAD-CRUST" VOLCANIC BOMB FROM MT. PELÉE
The specimen is 2 feet 2 inches in height

THE AMERICAN MUSEUM JOURNAL

familiar with the rank vegetation which clothed the slopes of these mountains with tropical verdure before the eruptions took place. Ejecta in the shape of dust and lapilli (= volcanic sand and gravel) were scattered all over the islands and distributed over a very wide area beyond, but the "area of devastation" may be considered to be confined to the limits within which buildings were destroyed and crops ruined for the time being. Plotting these areas on the British Admiralty charts as well as possible without actual surveys and then measuring the areas with a planimeter, I find that about 46 square miles, practically one-third, of the island of St. Vincent, and about 32 square miles, one-twelfth, of the island of Martinique were laid waste by the material thrown out by the volcanoes between May 5 and July 6. Within a few months the tropical rains will have washed the coating of ashes from a large portion of these areas and vegetation will hide the ruin wrought by the eruptions; while, unless the activity continues severe, a very few years will suffice to restore the islands to their former verdure. Over much of the devastated district on each island the roots of the grass and other vegetation were not killed and even before my departure from Martinique, July 6, the hillsides overlooking St. Pierre were becoming green and the grass was asserting itself much nearer to the centre of destruction. I found uninjured grass roots within ten feet of the very rim of the crater. But nothing can restore life to the 30,000 human beings swept out of existence on Martinique and to the 1350 persons destroyed on St. Vincent. The sugar factories will be long in rebuilding, especially upon St. Vincent, whence prosperity departed years ago and where the people have been impoverished by a series of hurricanes and by the decline in the price of sugar.

The material thrown out by both volcanoes contains fragments of the old surface rocks of the islands as well as fresh lava brought up from the earth's interior by the present activity. The proportion of old lavas in the ejecta of La Soufrière seems to be greater than it is in the ejecta of Mt. Pelée, though the largest blocks have been thrown out by the latter. A monster of this kind lies upon the plateau between the Sèche and Blanche rivers not

THE AMERICAN MUSEUM JOURNAL

more than 200 yards from the site of Guérin sugar works—the first notable victim of the fury of Pelée. This block is about 22 feet high, 30 feet long and 24 feet broad, and the day I photographed it (June 25) it was still very hot. It may have been thrown out during the great eruption of June 6. More interesting, however, than the “ejected blocks” are the “bread-crust bombs.” The former were cast out of the crater in a heated, but not molten condition, while the latter are masses of lava which were thrown out of the volcanoes in a melted or partly solidified condition. The bombs are glassy in structure but contain porphyritic crystals, the interior being porous in texture, while the exterior is solid. The solid exterior in cooling contracted and formed gaping cracks in every direction, the result giving an appearance like the crust on a loaf of bread, hence the name. I brought several of these bread-crust bombs to the Museum from each volcano, and a choice specimen 26 inches across, from Mt. Pelée is now on exhibition. The bombs thrown out by Pelée were of all sizes, from those weighing a few ounces up to one about 15 feet long which we found on the eastern rim of the crater. There had been no *stream* of lava yet from either volcano in this series of eruptions, up to the time of my leaving the islands.

The activity of La Soufrière seems to have been concentrated in two violent efforts resulting in the eruptions of May 7 and 18, when more material was thrown out than had been ejected from Mt. Pelée up to the time of my departure. After May 18 La Soufrière became less and less active (though a severe earthquake was reported from Kingstown, St. Vincent, July 17), until late in August, when activity increased and there were terrible eruptions August 30 and September 3. Mt. Pelée, however, has had many severe outbursts since the memorable 8th of May, and even as I pen these words cable dispatches relate some of the particulars of great eruptions which took place in the last days of August and early in September. These outbursts are reported to have been greater than any of their predecessors, and Morne Rouge is said to have been destroyed August 30. I spent four nights at this beautiful village in June

THE AMERICAN MUSEUM JOURNAL

and could see no reason then for its escape from destruction by the eruptions.

It seems as if Pelée were following the history of the 1883 eruption of Krakatoa, which began vigorously in May and culminated in a grand explosion in the latter part of August which partly destroyed its island. Mt. Pelée's great outbursts this year have been on an ascending scale of magnitude, though decreasing in frequency, but it is not wise to attempt to predict what will happen before the volcano becomes quiet again.

A preliminary report upon the writer's observations during his stay upon the islands is in press and will be issued soon as a part of the *Museum Bulletin*. This report will be illustrated with maps of both islands and many photographs, most of which are from negatives taken by the writer. The recent great outbursts, however, have made further important changes on the islands, necessitating additional studies before a final report can be prepared.

EDMUND OTIS HOVEY.

RECENT ETHNOLOGICAL WORK OF THE MUSEUM.



FOR many years the ethnological collections of the Museum have been housed temporarily in various halls. The completion of the southwest corner of the building has made it possible to advance the permanent installation materially. For a number of years the collections from the North Pacific coast of America have been on exhibition on the ground floor of the north wing. When the west wing and the southwest corner building were erected, the ground floor of each was allotted to ethnological collections.

Two points of view seemed most important in planning for the development of these collections. On the one hand, the principal aim of an ethnological exhibit had to be borne in mind. This is to illustrate the various forms of human culture, bringing home the fundamental unity of the human mind, and showing how its achievements depend upon history and environment.

THE AMERICAN MUSEUM JOURNAL

To accomplish this, representative collections from all the races of man are required. On the other hand, in an American museum, the achievements and the history of the American race are naturally of prime interest, so that it has seemed desirable to treat problems relating to America, and particularly North America, with special care. The efforts of the Museum have been in these two directions, and have been carried forward since 1895 under the supervision of Prof. Franz Boas.

On account of the rapid disappearance of ancient customs among the North American Indians, and the importance of preserving all we can of what pertains to the natives of our own country, work on this continent was taken up first. The field is so vast, however, that concentration on certain lines seemed necessary. One of the least explored fields in American ethnology is found in California and Oregon. Through the liberality of the late C. P. Huntington and of the late Henry Villard, the Museum was enabled to start this work, which was intrusted to Professor Livingston Farrand and Dr. Roland B. Dixon. Later, the funds for continuing the work in this region were provided by Mr. Archer M. Huntington and by Mrs. Arabella Huntington. This work is still in progress.

The efforts of the American Museum in behalf of Californian ethnology have had the effect of stimulating the University of California to like endeavor. Mrs. Phoebe A. Hearst has provided funds for ethnological work, which has been placed in charge of Dr. A. L. Kroeber, who was a valued collaborator of the American Museum of Natural History. Through the co-operation of Messrs. Dixon and Kroeber, and co-ordination of their work our knowledge of the tribes of California has been much advanced, and the Museum is now in possession of considerable collections from the northern part of that State. The work in Oregon also is still in progress. Professor Farrand, during the first year of his field work, devoted himself to the study of the coast tribes, while at present he is investigating the Sahaptin.

Another task which has seemed of great importance is the investigation of the decorative art of the North American Indian. This work has been carried on particularly by Dr. Kroeber and

THE AMERICAN MUSEUM JOURNAL

Dr. Clark Wissler. Dr. Kroeber made this the most important part of an investigation of the Arapaho, the funds for which were provided through the liberality of Mrs. Morris K. Jesup. During the present year, the inquiry is being continued by Dr. Wissler, among the Dakota. Through the work of these collectors and the special attention paid by other investigators to the same problem, the Museum possesses an unrivalled collection, illustrating diverse forms of primitive art. Besides the collections from the Arapaho and the Dakota, such collections from Mexico, California, the North Pacific coast, the interior of British Columbia, and from the Amur River are on exhibition.

Two other important investigations have been taken up by the Museum—one, a study of the Shoshone tribes, which has been intrusted to Mr. H. St. Clair, 2nd; and the other, the study of the Algonquin tribes, which is in the hands of Mr. William Jones. These two investigations are being carried on jointly by the Museum and the Bureau of American Ethnology. The student who tries to understand the customs of a people must study their language, if his work is to be thorough. It is therefore of great advantage when linguistic and ethnological work can be done together. The Bureau of Ethnology is making linguistic researches, and therefore co-operation between the Bureau and the Museum is highly advantageous to science. The ethnological work of Messrs. Jones and St. Clair is done for the Museum, while their linguistic researches, largely based on records of tribal traditions, belong to the Bureau of Ethnology. During the present year, Mr. Jones is continuing his studies of the Sauk and Fox, while Mr. St. Clair is spending the greater part of the summer among the Comanche. He is also going to make a brief tour of all the Shoshonian tribes with a view of laying out the work for the coming years. Mr. Jones's work is intended to cover, in course of time, other Algonquin tribes.

Investigations are being carried on also among the Salish tribes of Washington and British Columbia. Some of these tribes had been studied before, in connection with the work of the Jesup North Pacific expedition, because knowledge of their culture is required for a clear understanding of the culture of the

THE AMERICAN MUSEUM JOURNAL

North Pacific coast. Other tribes of this stock live far to the east and south, and their culture is more closely related to that of the tribes east of the Rocky Mountains. Researches among them are being carried on by Mr. James Teit, who already has done much excellent work for the Museum.

During the present year, work has also been taken up among the northern Athabascans, who up to the present time have been practically unknown. Collections and inquiries among the eastern Eskimo, in Hudson Bay and Baffin Land, which were begun several years ago, are still in progress.

Much work has been done toward the formation of an exhibit of the types of man found in aboriginal America. The collections that have been made consist of skulls, skeletons, photographs and plaster casts. Great weight has been laid particularly on the last feature, because this seems the only feasible method of permanently preserving the vanishing type of the American natives. Collections of types from the North Pacific coast, California, Dakota, Smith Sound, New York, Mexico, the Southwest, Siberia and Japan are in the Museum. A special report of work in this line, done by Dr. Hrdlička, will be found on another page of this number of the JOURNAL.

The field work of the Jesup North Pacific expedition, which has occupied a large share of the attention of the Department for several years, will be finished during the present summer. The object of the expedition was a thorough exploration of the tribes of the North Pacific coast, both in Asia and America, with a view of determining the complex history of this area and the early relations between the tribes of Asia and America. The collections of this expedition, in which twelve scientists have taken part, are very exhaustive, and cover the whole area from the Columbia river in America to the Amur river in Asia. In April last Mr. Waldemar Jochelson completed his difficult journey from Gishiga, on the Sea of Okhotsk, to Yakutsk. His reports were received in August. He writes "Our journey from Gishiga to Verchne-Kolymsk, occupied 56 days. We left Gishiga Aug. 15 and reached Verchne-Kolymsk Oct. 9, 1901. This was the most difficult journey I have ever undertaken. The trail as far

THE AMERICAN MUSEUM JOURNAL

as the Stanovoy Mountains, was tolerable, but further west, swamps, rivers, mountain-passes, and almost impassable thickets made progress very difficult. On the upper course of the Korkodon we had to rest our horses. The cold became more intense day by day. In order to reach Verchne-Kolymsk before the closing of the rivers, I left my Yakut guides to follow with the pack train and started on a raft down the Korkodon, to reach the uppermost village of the Yukagheer. There I hoped to meet boats that I had previously ordered. This journey by raft occupied nine days. The river is very rapid, full of driftwood, and the descent was full of dangers. I stayed among the Yukagheer of the Korkodon for four days, in order to collect specimens and information. Then we continued our hurried journey by boat. On Oct. 7, when we were still 45 versts away from Verchne-Kolymsk, the river froze up, and we had to continue our journey on foot. On Oct. 21, when the weather had become somewhat settled, we visited the winter quarters of the natives, who live about 70 versts from Verchne-Kolymsk, and staid with them until Nov. 17. During this time I made a collection of ethnological specimens, photographs, masks in plaster of Paris and anthropometric measurements, and added to the information collected on my first expedition. I proceeded next to Nishne-Kolymsk where I studied the Yukagheer of that district. This work occupied the time until Feb. 15, 1902." After his return from this district, Mr. Jochelson turned his attention to the study of the Yakut, among which tribe he made a considerable collection.

The work of the Jesup expedition has contributed much to the Asiatic collections of the Museum, which have been made largely with respect to their bearing upon problems of American ethnology. In adding to the general collections of the Department, the same point of view has been adhered to throughout. It has seemed best to develop first those collections which have an immediate practical and scientific interest for America, while scientific considerations have led us to develop the Siberian collection. The culture of Siberia has been much influenced by China, which is occupying a more and more important place in

THE AMERICAN MUSEUM JOURNAL

the affairs of the world. For this reason a start has been made with the establishment of a Chinese department. The funds for this important enterprise were given by a friend of the Museum and the work has been placed in charge of Dr. Berthold Laufer, who had previously done work on the Amur river for the Jesup expedition. The object of his work is to make a collection illustrating the popular forms of the industrial, social and religious life of the Chinese, and to elucidate by a few selected collections the historical development and far-reaching influence of Chinese culture.

The comprehensive plan that has been pursued in the development of the Department has made it necessary for a number of years to elapse before a somewhat systematic exhibit could be made and for wide gaps to exist in many directions. At the same time, however, the method pursued has made it possible to make each exhibit a unit which has a definite scientific and educational significance. The scientific publications of the Department have kept pace with the building up of the collections and publications and collections illustrate each other.

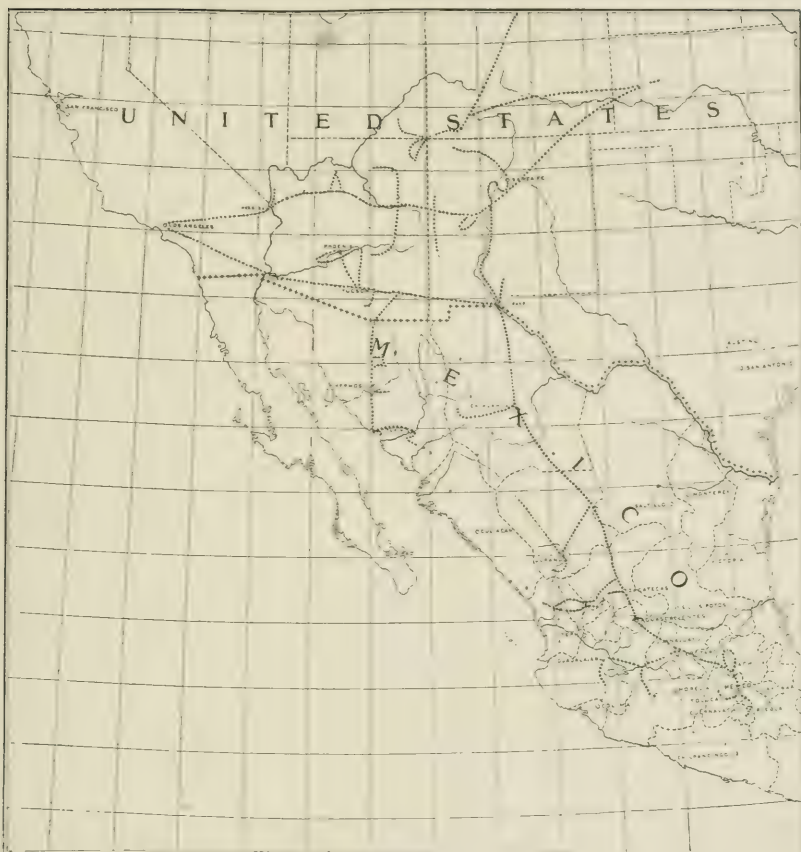
The general location of these ethnological collections in the Museum is as follows: The ground floor in the north wing contains material from the North Pacific coast; the west wing, collections from the Arctic coast of America and from the Plains; the southwest corner, those from Siberia. On the second floor of the west wing are the ethnological collections from the Southwest and from Mexico. In the gallery of the southwest corner, those from China, Japan, Polynesia and Africa.

ETHNOLOGICAL WORK IN THE SOUTHWESTERN UNITED STATES AND MEXICO.



R. A. HRDLÍČKA recently returned, after a little more than seven months' absence, from a successful trip to the southwestern United States and northern Mexico. This expedition, the fourth of the series devoted to the physical anthropology of the regions mentioned, has been referred to in Vol. II, No. 1, of the JOURNAL.

THE AMERICAN MUSEUM JOURNAL



MAP SHOWING THE ROUTES FOLLOWED BY DR. HRDLIČKA IN HIS INVESTIGATIONS
AMONG THE INDIANS OF THE SOUTHWESTERN UNITED STATES AND MEXICO.

All these expeditions, whose main object was the acquisition of a knowledge of the physical features of the present as well as of the ancient Indian populations over the territory covered before the advent of whites by the Cliff-Dwellers, Pueblos and branches of the Nahuas (among which are the Aztecs), were carried on by Dr. Hrdlička, under the supervision of Prof. F. W. Putnam, for the American Museum, the means being very generously furnished by Mr. Fred. E. Hyde, Jr.

The territory covered by the investigations is the most extensive ever covered in similar work by one observer. It extends

THE AMERICAN MUSEUM JOURNAL

uninterruptedly from southern Utah and Colorado in the United States to the State of Morelos in Mexico. The Indian tribes which to-day inhabit this region, and all of which, with the exception of the Seris,¹ have been visited and examined on the four expeditions, are as follows:

UNITED STATES:

Southern Utah.....	Pah-Utes.	
Southern Colorado.....	{ Utes.	
	{ Jicarilla Apaches.	
New Mexico.....	{ Navahos:	{ Taos.
	{ Rio Grande Pueblos	{ San Juan.
		{ Jemez.
		{ San Felipe.
		{ Cia.
		{ Isleta.
	{ Southwestern Pueblos	{ Laguna.
		{ Acoma.
		{ Zuñi.
	{ Mescalero Apaches	
	{ Hopi Pueblos.	
	{ White Mountain and San Carlos Apaches.	
	{ Mohaves, eastern and western.	
	{ Suppais.	
Arizona.....	{ Hualapais.	
	{ Papagos.	
	{ Pimas.	
	{ Maricopas.	
	{ Yumas (mostly in California):	

MEXICO:

Sonora.....	{ Opatas.
	{ Yaquis.
	{ Mayos.
	{ Seris.
Chihuahua.....	Tarahumares.
Durango.....	Tepehuanes.
Tepic.....	Coras.
Jalisco.....	{ Huichols.
	{ Tepecanos.
	{ Nahuas (Tuxpan).
Hidalgo.....	Otomis.
Mexico.....	Mazahuas.
Michoacan.....	Tarascos.
Morelos.....	Aztecs.

¹ A small, dangerous tribe living on Tiburon island in the Gulf of California. The data obtained on the Seris are restricted to measurements of one complete skeleton, two skulls and one living individual.

THE AMERICAN MUSEUM JOURNAL

The material obtained on the four expeditions comprises measurements of and observations on nearly 3000 individuals, over 1500 photographs, about 300 skulls and skeletons, 120 facial casts and about 3000 ethnological and archæological specimens. The skulls and skeletons gathered are mostly those of extinct tribes, and will furnish important measurements and observations for comparison with those of the present Indians of the region. Moreover, besides showing the racial characteristics, the bones are of value in showing the relative frequency of fractures and various pathological conditions,—matters which are of special interest to members of the medical profession. The specimens and casts will in time be placed on exhibition.

The data obtained will be elaborated by Dr. Hrdlička, and will appear in the publications of the Museum. A somewhat detailed report of the work will be read before the Congress of Americanists, which will meet at the American Museum this month. The accumulated data should, especially in connection with similar and contemporaneous work done by Professor Starr in southern Mexico and under Professor Boas along the northwestern coast, add materially to our knowledge of the physical status of the American aborigines.

Some of the specimens secured on this year's expedition deserve special mention. Among the skulls there are eleven of Otomis; an ancient, well-preserved male cranium from the ruins of Tula (the supposed Toltec capital); and twelve skulls of the Yaquis. Eleven of the last-named were obtained, with some ethnological specimens, from the recent Yaqui-Mexican battlefield in the Sierra of Mazatlan, in Soñora, and one is that of an executed and then half-cremated Yaqui prisoner from the Yaqui river. Among the ethnological specimens there is a series of interesting objects from the sacred cave of the Huichol Indians (Jalisco), some exceptionally well woven Yaqui baskets, two fine examples of old Nahuatl beadwork, two rare Mayo blankets, a collection of the native food-stuffs of the Hualapais, etc. Among the photographs the most prized are those of the Yaquis, with views of their country, including several picturesque Mexican fortified posts or barracks.

THE AMERICAN MUSEUM JOURNAL

The success of the several expeditions of Dr. Hrdlička is due in no small degree to the kind and efficient assistance he received from the authorities both of the United States and of Mexico, for which the Museum takes this occasion to express grateful acknowledgment. Through the courtesy of the authorities of the Mexican National Museum, Dr. Hrdlička was enabled to examine the valuable craniological collection in that institution. A word of grateful appreciation is due also to the officers of the railroads utilized, and particularly to those of the Santa Fé and the Mexican Central, for their aid to the expedition.

DEPARTMENT OF PUBLIC INSTRUCTION.

AUTUMN COURSE OF LECTURES TO TEACHERS.

BY PROFESSOR ALBERT S. BICKMORE.

October 18 and 25.—The Swiss Alps.

November 1 and 8.—The French Alps.

November 15 and 22.—Historic Towns of Central France.

November 29 and December 6.—Historic Towns of Southern France and the French Riviera.

NEWS NOTES.



DURING the past three months there have been some notable additions to the gems and gem material comprised in the Morgan gift. The most striking of these are the large blocks of Amethyst crystals which were found in a recently discovered grotto in Rio Grande do Sul, Brazil. These have been installed on the tops of the cases on the west side of the Gem room. One of the most precious single objects among the additions is a ceremonial axe-hammer of Agate which was once the property of Cardinal Borgia and which bears ancient inscriptions. The new series of Ceylon Sapphires is highly prized. It contains two blue and yellow stones weighing 21 carats each,

THE AMERICAN MUSEUM JOURNAL

a yellow gem of 100 carats and a wonderful blue Star-Sapphire weighing 541 carats which for generations was an heirloom in the family of a Nabob of the island. Besides these there should be mentioned a Rubellite, or pink Tourmaline, of 40 carats, from Madagascar, a 57-carat yellowish-green Beryl from Ceylon and an Amethyst weighing 142 carats from the Ural Mountains. The last possesses the rather unusual property of scintillating in a strong light.

THE mineral collection has been enriched by the acquisition of a specimen of Enargite — a compound of copper with sulphur and arsenic — which surpasses any specimen of the species heretofore in the Museum. It was found in Montana.

IN August the Department of Conchology received a collection of very handsome shells belonging to the group of Cypræas. The series was obtained by the late Mrs. Marie A. Witthaus, and represents the result of years of painstaking selection. It is remarkable for the perfection of the individual specimens. The collection has been presented to the Museum by Dr. R. A. Witthaus.

A MAHOGANY log which has been completely honeycombed by the Teredo shell has been put on exhibition in the Shell hall.

THE Department of Vertebrate Palæontology has received several valuable specimens and casts during the past summer from foreign museums in exchange for American fossils. The British Museum has sent a finely preserved skeleton of a Plesiosaur or "Great Sea-Lizard," along with other specimens found at the rich fossil-quarry near Peterborough, England. The Plesiosaurs form a group of extinct marine reptiles, whose long neck and tail and short massive trunk with four flippers have suggested the rather apt comparison of the animal to "a snake threaded through the body of a turtle." Representatives of the group are rare in our western fossil-fields, and this specimen is the first acquired by the American Museum.

A skull of the Woolly Rhinoceros (*Rhinoceros tichorhinus*)

THE AMERICAN MUSEUM JOURNAL

and a cast of the skull of the Elasmothere (*Elasmotherium sibiricum*) another extinct Rhinoceros of gigantic size and peculiar aspect have been received from the University of Moscow; and the skull of a third large extinct Rhinoceros from Europe (*Rhinoceros pachygnathus*) has come from Munich University.

The three specimens will add much to the value of our series of skulls of extinct Rhinoceroses, which already represents the majority of the species known, and is far more nearly complete than that of any other museum.

A large series of casts of limbs and feet of Dinosaurs, or Giant Reptiles, from the Triassic formation of Germany, has been received from the University of Tübingen. Dinosaurs from this very ancient formation are extremely rare in America; all of those in the Museum collections come from later formations.

PROFESSOR BICKMORE, who has been spending the summer in England and on the Continent, has just returned to the Museum. He attended the meetings and took part in the conferences of the Nature Study convention in London, in July, where the Department of Public Instruction of this Museum made an exhibit of photographs and stereopticon slides illustrating its methods of "visual instruction."

DR. HRDLIČKA has returned to the southwestern States and northern Mexico to make supplementary studies upon the Indian tribes of that region among whom he already has spent so much time.

THE Linnæan Society of New York will hold its regular meetings in the small lecture hall of the Museum on Tuesday evenings, October 14 and 28. The first evening will be devoted to reports from members regarding their summer work, while the second evening will be occupied by a talk by Frank M. Chapman on "Bird Studies with a Camera in 1902," illustrated by means of lantern slides. The public is cordially invited to attend these meetings.

The American Museum Journal

VOL. II.

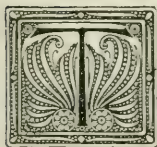
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No. 8.

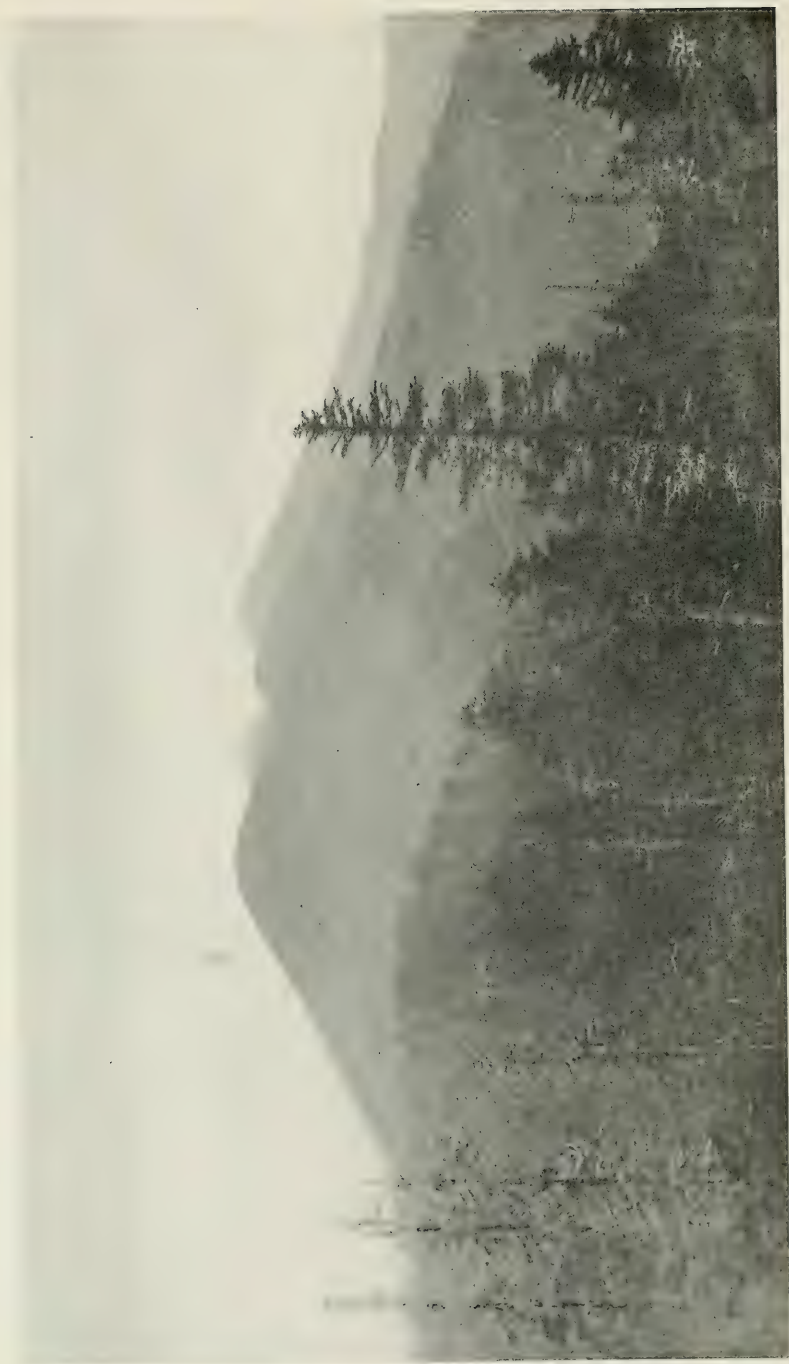


WITH this number of the JOURNAL there is issued a Supplement entitled "The Sequoia: A Historical Review of Biological Science," which relates to the history of the Big Tree section which is on exhibition in the southeast corner hall, just beyond the Wood Hall, and cites the most striking events in the development of the natural sciences, almost all of which have come within the life-period of this tree. The noble specimen of Sequoia which forms the subject of this paper was presented to the Museum in 1893 by the late Collis P. Huntington, and the institution is indebted to Mrs. Collis P. Huntington for the funds needed for its preparation and installation.

ENTOMOLOGICAL WORK IN THE BLACK MOUNTAINS OF NORTH CAROLINA.



THE collections of the Entomological Department of the Museum have been greatly enriched during the past season by about five weeks' work in the Black Mountains of North Carolina which the writer was enabled to do through the generosity of the late Very Reverend Eugene A. Hoffman. One object of the expedition, which was in the field from June 9 to July 15, was to explore the region of the main chain situated north of Mount Mitchell, and including the following peaks: Black Brothers, Balsam Cone, Cat-tail Peak, Hairy Bear, Deer Mountain, Long Ridge, Middle Point and Bowlen's Pyramid. The prevailing heavy fogs, rain and hail storms, however, rendered it impossible to penetrate these wild regions any farther than to the other side of the summit of the Black Brothers, shown on the accompanying plate. Another object of the trip was the obtaining of



Photograph by W. Beutenmüller.

THE BLACK BROTHERS, NORTH CAROLINA.

THE AMERICAN MUSEUM JOURNAL

species to be found only in June, and the results in this respect have been very satisfactory, since all the species found are different from the ones collected heretofore, and at least four thousand specimens were obtained.

In the course of this and the preceding three trips the following peaks have been explored by me in quest of beetles: Mt. Greybeard, Rocky Knob and Toe River Gap, in the Blue Ridge, which form the connecting link between the Blue Ridge and the Black Mountains; Potato Knob, Clingman's Peak, Black, Gibbs, Hallback (or Sugar-loaf), Stepp's Gap, Mitchell and Black Brothers, in the Black Mountains, and Bull Head and Craggy Dome in the Craggy Range. The valleys as far as Balsam Gap and Asheville, as well as other hollows and ravines, have been explored for their beetles.

The forests of the Black Mountains are characterized by a dense growth of Carolina balsam (*Abies frazeri*) and black spruce (*Picea mariana*). In certain places they contain also mountain ash (*Pyrus americana*), wild red cherry (*Prunus pennsylvanica*), hemlock (*Tsuga canadensis*), mountain maple (*Acer spicatum*), and *Rhododendron catawbiense*. The slopes of the mountain are coated with a deep layer of damp moss, and the ground is strewn with fallen timber in various stages of decay. The Black Mountains derive their name from the dark foliage of the evergreens.

The Blue Ridge, Craggy Range, and lowlands are covered principally with red oak, white oak, chestnut, sweet birch, locust, walnut, buckeye, tulip tree, hickory, laurel and rhododendron (*R. maximum*). In the valleys are found also large stretches of chinquapin chestnut. The beautiful fiery azalea is also found on the mountain-sides, and when in bloom, together with the purple rhododendron (*R. catawbiense*), yields an abundance of rare beetles, principally Cerambycidae, Curculionidae, Chrysomelidae, Elateridae, Cistelidae, Lampyridae, and Mordellidae. The chinquapin blossoms also yield a harvest of rare species.

The white rhododendron (*R. maximum*), which blossoms later than the mountain species, yields very little or nothing in the line of beetles.

THE AMERICAN MUSEUM JOURNAL

The species found in the valleys and on the Blue Ridge are somewhat different from those to be found on the Black Mountains, owing to the differences in flora and temperature, which have the effect of limiting the distribution of certain species.

On the ridge leading from Mt. Mitchell to Black Brothers, and on Mt. Gibbs, the very rare beetle, *Cychrus guyotii*, was taken, as well as *Cychrus canadensis* and *Cychrus andrewsii*. The first two occur only on the high elevations, while the last is also found on the slopes and in the valleys together with *Cychrus bicarinatus*. *Noimaretus debilis*, *N. hubbardi*, *N. imperfectus* and *Pterostichus blanchardi* also have been taken.

The writer has made three trips to the same general region in the interest of the Museum in previous years, the first being a vacation trip to the Cowee Mountains, south of Asheville, N. C., in 1895, and the second and third being Museum expeditions to the Black Mountains, the Big Craggy and the Blue Ridge in the summers of 1900 and 1901. Notices of these expeditions have been given in the JOURNAL, Vol. I, p. 44, and Vol. II, p. 4. On the four trips nearly one thousand species have been collected, and the material now on hand, together with lists of the species taken by other collectors in the Cumberland Gap, Va., Round Knob, N. C., Retreat, N. C., Highlands, N. C., and Roan Mountains, is enough to form the basis for an extended monograph on the insect fauna of the region.

Additional material, however, is needed, especially from the northwest chain of the Black Mountains, and information concerning the species to be found in May and early June is required to complete the work.

WM. BEUTENMÜLLER.

COLLECTING FLAMINGOES AND THEIR NESTS IN THE BAHAMA ISLANDS.

IN preparing groups of birds and mammals for exhibition the Museum aims to secure material which will be not only attractive and scientifically valuable, but also and more especially that which will represent those animals and phases of animal life which



Photograph by F. M. Chapman.

FLAMINGO NESTS: PART OF A COLONY OCCUPIED IN 1900.

THE AMERICAN MUSEUM JOURNAL

are rapidly disappearing. The Bird Rock group, for example, is not only beautiful in itself and it not alone illustrates the breeding habits of seven species of sea-birds, but, as a whole, it shows a characteristic phase of coast bird-life which in nature can now be found only in the most isolated or inaccessible localities. Acting, therefore, on this principle the writer has made two journeys during the past season, one to the Bahama Islands and one to the coast of Virginia, to secure material for bird groups, funds for which have been presented to the Museum by John L. Cadwalader, Esq.

The object of the first trip was to find and collect nests and specimens of the Flamingo. This beautiful bird is yearly becoming rarer, and still little is known of its breeding habits, while, so far as the writer is aware, at the time this expedition was planned, no example of the singular nest built by the Flamingo existed in this country, those exhibited in Pittsburg and at Washington being made of *papier maché*.

Since the single flock of Flamingoes which frequents the vicinity of Cape Sable, Florida, is the only one known to inhabit the United States, and because its nesting grounds have not yet been discovered, it was decided to visit the Bahama Islands in search of the desired nests and specimens. In the latter part of April, therefore, the writer sailed for Nassau, where he joined J. Lewis Bonhote, Esq., of Cambridge, England. Mr. Bonhote was formerly Governor's Secretary at Nassau and his experience among the islands was of the utmost assistance in the furtherance of our plans. We chartered a small schooner and set sail for Andros, the largest of the Bahama Islands and well known to naturalists as a resort of Flamingoes. During the winter these birds live chiefly on the west coast of the island, where the shallow water and soft marl bottom afford them an abundance of food and prevent pursuit either by boat or on foot; but in May they gather in some before-frequented lagoon in the interior of the islands, far from the habitation of man, to rear their young. These breeding resorts are few in number and their whereabouts are comparatively unknown. Thanks, however, to Mr. Bonhote, who had reconnoitred the ground, we

THE AMERICAN MUSEUM JOURNAL

succeeded in reaching a large Flamingo rookery well in the heart of Andros without undue difficulty. Our schooner was left at anchor behind the shelter of some outlying reefs and the final part of the voyage was made in small boats.

The locality is only a few inches above sea level and is characterized by wide stretches of shallow lagoons bordered by red mangrove trees with occasional bare bars of gray marl, and by outcrops of coralline rock so eroded and water-worn into blade-like edges and sharp, jagged pinnacles that walking is attended by much danger. Our tents were pitched on a sand-bar and preparations made to visit the Flamingo colonies known to exist in the vicinity.

Subsequent research showed that the locality was regularly frequented by these birds as a breeding resort, but that apparently a different spot was chosen each year. Eight groups or villages of nests were found within a radius of a mile, each evidently having been occupied but one year. The largest of these, placed on a mud-bar only an inch or two above the level of the surrounding water, was 100 yards in length and averaged about 30 yards in width. An estimate, based on an actual count of a portion of this colony, gave a total of 2000 nests for an area of, approximately, only 27,000 square feet.

This colony we judged to have been occupied in 1900; while that of 1901 was found at a distance of a mile, the nests being scattered about in a dense growth of mangroves. Here the birds were found at work upon their nests for the present year, Mr. Bonhote seeing a flock estimated to contain about 700 birds—a sight of surpassing beauty. Although no shot was fired and a retreat was promptly made, the birds were disturbed by this intrusion and either discontinued operations or removed to some other locality and eventually we were forced to leave without seeing fresh nests. Those in process of building, however, told somewhat of the manner of their construction. The nests of 1901, built among the mangroves, were in an excellent state of preservation (some even containing eggs) and being partly sun-baked could be transported more readily than new nests. Indeed it is doubtful if the latter could be removed.

THE AMERICAN MUSEUM JOURNAL

Under the best circumstances, the task of getting these nests whole to our schooner, not to mention the Museum, was one of unusual difficulty. The largest I attempted to take measured 18 inches in diameter at the bottom, 13 at the top, 9 inches in height and weighed upward of one hundred pounds. One solid mass of mud and dried only externally, it needed but a slight jar to break the strongest of these nests into fragments, so that there seemed but slight prospect of any specimens reaching New York in safety.

Our negro boatmen were not accustomed to work of this character and it required special inducements to tempt them to wade barefooted the coral-beset lagoons or to traverse the keen-edged rocks with burdens of from fifty to a hundred pounds on their heads. At last our selected examples were placed in a canoe and started on their voyage to the schooner, which they reached with the breakage of three out of nine specimens. The subsequent necessity of beaching the schooner to repair a leak and a rough night during the return passage to Nassau further endangered them, but after several minor mishaps they accomplished in safety the first part of their voyage to the Museum. In Nassau they were treated with a solution of gum arabic, which hardened them superficially and, after being wrapped in plaster of Paris bandages, they were packed separately in large boxes with sponge clippings and thus reached New York in an undamaged condition.

Specimens of Flamingoes themselves were also secured together with photographs of their rookeries. The four nests collected differ from the conventional idea of a Flamingo's nest in being much lower and of greater diameter. They, however, fairly represent the prevailing types of nests examined. Doubtless the height of the nest, like the height of the "chimneys" of fiddler crab burrows, is governed by the rise of the water. Built wholly of mud, which is scooped up from about the base of the nest by the bird, it is necessary that the site chosen shall be near enough to water to insure an abundant supply of sufficiently soft material. Such a site, however, brings the nest within reach of the tide or places it in a low situation which

THE AMERICAN MUSEUM JOURNAL

may be subsequently flooded by heavy rains, and the birds must build their nests high enough to protect their contents from the water. The combination of these two conditions has resulted in the production of a mud cone which, in the colonies examined, was never more than twelve inches in height; but nests eighteen inches high have been reported.

In the slightly hollowed top of this adobe dwelling a single white egg is laid. Of the period of incubation, condition of the young at birth, time it passes in the nest, manner of feeding, etc., practically nothing is known and the nesting habits of the species offer a fine field for study to any ornithologist who is desirous of filling one of the blank pages in the history of our birds.

FRANK M. CHAPMAN.

LECTURE ANNOUNCEMENTS.

THE remaining lectures of the current course of Professor Bickmore's lectures to teachers are as follows (Saturday mornings at 10.30 o'clock):

November 1 and 8.—"The French Alps."

November 15 and 22.—"Historic Towns of Central France."

November 29 and December 6.—"Historic Towns of Southern France and the French Riviera."

PROFESSOR BICKMORE's lectures to members of the Museum and their friends will be given on Thursday evenings in November and December in accordance with the following programme:

November 20.—"The Swiss Alps."

December 4.—"The French Alps."

December 11.—"Historic Towns of Central France."

December 18.—"Historic Towns of Southern France and the French Riviera."

THE Tuesday evening course in coöperation with the Department of Education of the Borough of Manhattan, Dr. H. M. Leipziger, Supervisor of Lectures, was begun October 7 and will

THE AMERICAN MUSEUM JOURNAL

continue until December 16. The whole series of eleven lectures, all of which are illustrated, is devoted to Asiatic geography. The list of lecturers and their subjects is as follows:

October 7.—Dr. JOHN C. BOWKER, "New Zealand."

October 14.—Dr. JOHN C. BOWKER, "Contrasts." A study of the customs of people in many lands, compared and contrasted by phrase and picture.

October 21.—Dr. WM. E. GRIFFIS, "Japan."

October 28.—Dr. KENNETH F. JUNOR, "China."

November 4.—Mrs. HELEN M. JACKSON, "Manners and Customs of Hindus." Illustrated by costumes.

November 11.—CYRUS C. ADAMS, "New Things We have Learned about Africa."

November 18.—A. C. MACLAY, "The Vale of Cashmere."

November 25.—JOEL WERDA, "Persia."

December 2.—Mrs. J. H. HAYNES, "The Bedouins of the Euphrates."

December 9.—S. W. NAYLOR, "Jerusalem and Her Environs."

December 16.—G. C. MARS, "Cairo."

Four lectures by Dr. HENRY E. CRAMPTON on "Some Interesting Aspects of Evolution":

October 18.—"The Problem of Evolution."

October 25.—"Interesting Facts Showing Evolution."

November 1.—"Interesting Facts Showing the Method of Evolution."

November 8.—"Method"; Conclusion and Summary.

November 15.—CYRUS C. ADAMS, "Earthquakes."

November 22.—Dr. E. O. HOVEY, "Volcanoes."

November 29.—GEORGE DONALDSON, "Martinique."

December 6.—W. T. ELSING, "Ants and Bees."

December 13.—WM. HARPER DAVIS, "Snakes."

The lectures on November 15, 22 and 29 will be illustrated with stereopticon views.

THE AMERICAN MUSEUM JOURNAL

NOTES.

THE International Congress of Americanists held its thirteenth convention from October 20 to 25 in the halls of the Museum, by invitation of Morris K. Jesup, Esq., President. The sessions were well attended by the anthropologists and others interested in the study of the aboriginal inhabitants of the Western Hemisphere, not only from this country but also from abroad. More than eighty papers were presented by members. After the adjournment of the congress the foreign members participated in an excursion to Philadelphia, Washington, Pittsburg, Cincinnati, and Chicago to visit the scientific and educational institutions of those cities. A halt *en route* was made to visit the prehistoric earthworks in Ohio known as "Fort Ancient."

THE meetings of the New York Academy of Sciences are held in the Assembly Hall of the Museum Monday evenings at 8.15 o'clock. During the current month the meetings will be held as follows:

November 3.—Business meeting and Section of Astronomy, Physics, and Chemistry.

November 10.—Section of Biology.

November 17.—Section of Geology and Mineralogy.

November 24.—Section of Anthropology and Psychology.

All persons interested in the subjects under discussion are cordially invited to attend the meetings.

THE annual convention of the Audubon Society of the State of New York was held in the Museum on Thursday, October 16. Reports were presented by the officers, and illustrated addresses were delivered by William Dutcher and Frank M. Chapman.

A LARGE group representing the Osprey, or Fish-Hawk (*Pandion haliaëtus carolinensis*), was completed recently and has been placed on exhibition on the Gallery Floor near the elevator. The materials for this group were collected by Frank M. Chapman on Gardiner's Island, L. I., June 3, 1901, and were prepared for exhibition by H. C. Denslow and E. W. Smith.

THE AMERICAN MUSEUM JOURNAL

IN the latter part of July Mr. Chapman made his second trip of the season for the purpose of getting material for the Cadwalader bird groups. He visited Cobb's Island on the coast of Virginia, north of Cape Charles, which formerly was a famous place for beach-breeding sea-birds. The ravages of millinery collectors have completely exterminated some species and greatly reduced the numbers of others, but the island still is frequented by great numbers of birds of species for which as yet Fashion has made no call. It is proposed to represent a beach scene with its feathered inhabitants and thus preserve for all time an accurate, graphic record of conditions which even now are on the verge of extinction. This group will be a companion piece for that representing the sea-bird life of rocky coasts.

Through information obtained by correspondence with the captain of the Life-Saving Station situated on Cobb's Island the trip was timed so that the island was reached at exactly the right date to collect the material which shortly will be exhibited in the gallery of the Bird Hall.

SOME of the material collected by Dr. E. O. Hovey on the expedition to Martinique and St. Vincent, noticed in the last number of the JOURNAL, has been placed on exhibition near the carriage entrance, together with a relief map of the Island of Martinique and a series of transparencies illustrating some of the more striking features of the trip.





THE FALL OF "MARK TWAIN"

THE REDWOOD

A HISTORICAL REVIEW OF THE REDWOOD

BY GEORGE H. RICHMOND

Assistant Curator of the Museum

The *Sequoia* constitute a genus of trees which were abundant in temperate climates of the world during the glacial period. There are now only two living species, the "Redwood" (*Sequoia sempervirens*) and the "Big Tree" (*Sequoia gigantea*), both of which are very limited in their range.

The Redwood is found only in a narrow strip of land along the southern base of the Coast Range, extending from the southern base of the Coast Range to the mouth of the Klamath River. The Big Tree is still more limited in its range, being found only in a small area of land in the Sierra Nevada. The *Sequoia gigantea* which forms the subject of this paper was given to the Museum in 1891, by the late Collis P. Huntington. The Museum is indebted to Mr. Collis P. Huntington for the loan necessary for its preparation and installation, to the following maps: This area is bounded

on the north by the American River, and on the south by Deer Creek. The total distance between the most northerly group of trees and the most southerly group is about 100 miles. The Klamath River, which is the boundary between the Redwood and the Big Tree, is about 100 miles long.

The Redwood is a tree of great size, reaching a height of 300 feet, and a diameter of four or five feet. It has a very thick bark, and a very strong wood. It has a very long life, and is very common in the region where it grows. It is a very valuable tree, and is one of the most important trees of the world. It is a very beautiful tree, and is one of the most interesting trees of the world. It is a very useful tree, and is one of the most important trees of the world. It is a very beautiful tree, and is one of the most interesting trees of the world. It is a very useful tree, and is one of the most important trees of the world.

Quoting from the Bulletin, No. 28, of the United States Department of Agriculture (1900): "The Big Tree of the world,—the tallest, the largest, the oldest, the most economically good,—and if it were not known that they are the rarest of known tree species, and the most valuable of being the last living members of a genus,—it would be of little value." Professor Sargent describes the wood of the Big Tree as very light, and of a coarse-grained, but very durable texture.

THE SEQUOIA.

A HISTORICAL REVIEW OF BIOLOGICAL SCIENCE.

BY GEORGE H. SHERWOOD, A.M.,

Assistant Curator, A. M. N. H.

THE *Sequoia* constitute a group of trees which in past ages was abundant in temperate climates of Europe, Asia and America, but which during the glacial period were all but exterminated, only two living species, the "Redwood" (*Sequoia sempervirens*) and the "Big Tree" (*Sequoia gigantea*), surviving to represent the genus. Both are very limited in numbers and in distribution.

The Redwood is found only in a narrow tract of land extending from the southern border of Oregon to Monterey Bay, while the Big Tree is still more restricted, being confined to but ten isolated groves situated between the altitudes of 4000 and 8000 feet above the sea, on the western slope of the Sierra Nevada mountains (see accompanying map). This area is bounded on the north by the American river, and on the south by Deer Creek, and the total distance from the most northerly group (North grove) to the most southerly (Tule River grove) is only 260 miles. The King's River and Kaweah River grove is the largest both as to area and number of trees. The extent of this district is four or five miles in width, and eight or ten miles in length. It has a variation in altitude of 2500 feet. It is an interesting fact that as one proceeds from north to south the Big Trees flourish at higher and higher altitudes.

Quoting from Bulletin No. 28 of the United States Department of Agriculture (1900): "The Big Trees are unique in the world,—the grandest, the largest, the oldest, the most majestically graceful of trees,—and if it were not enough to be all this, they are among the scarcest of known tree species and have the extreme scientific value of being the best living representative of a former geological age." Professor Sargent describes the wood as follows: "The wood of the Big Tree is very light, soft, not strong, brittle, and coarse-grained, but very durable in contact

THE SEQUOIA

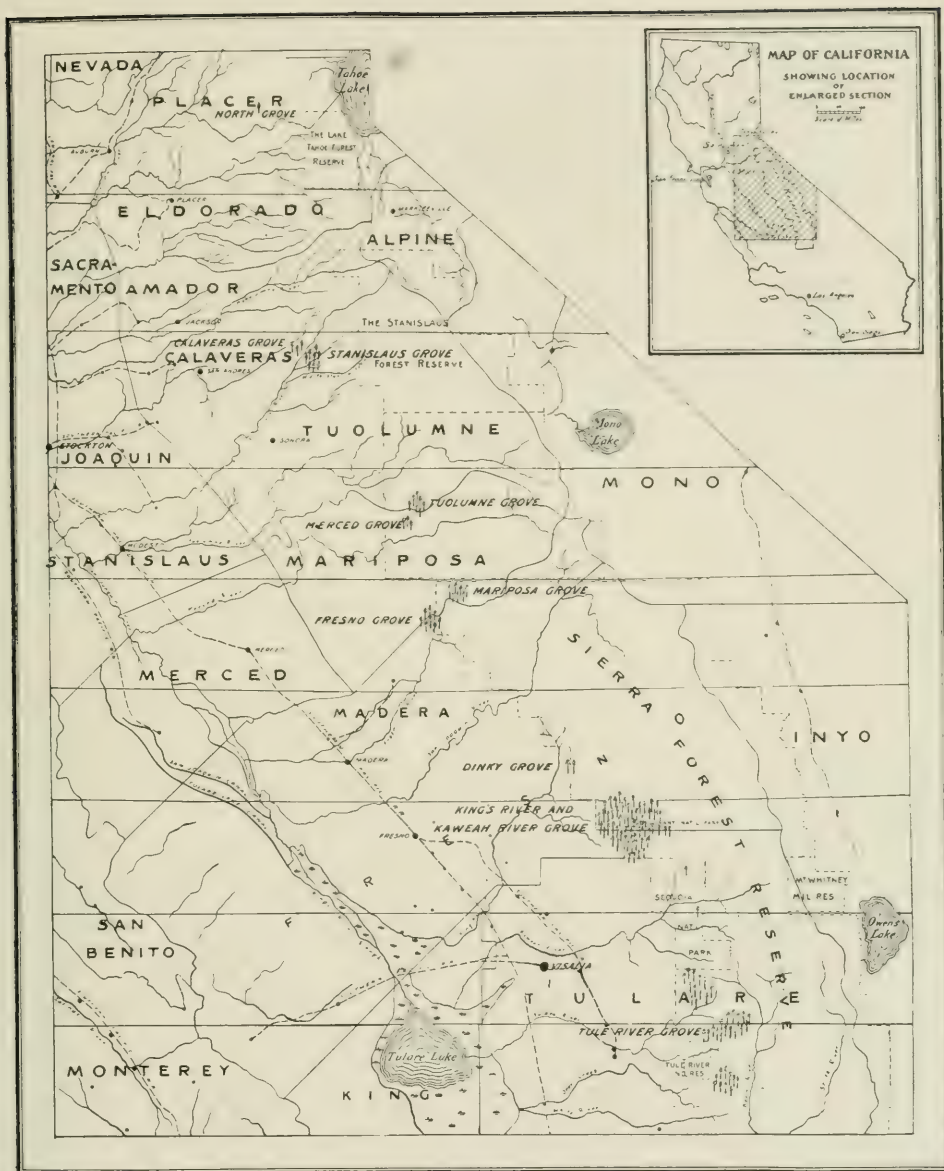
with the soil. It is bright clear red, turning darker on exposure, with thin, nearly white sapwood, and contains thin, dark colored conspicuous bands of small summer-cells and numerous thin medullary rays. The specific gravity of the absolutely dry wood is 0.2882, a cubic foot weighing 17.96 pounds. Manufactured into lumber, it is used locally for fencing and in construction, and is made into shingles."

The reproduction of the Big Tree is so slow and uncertain, and the methods of the lumbermen in cutting the timber so destructive, that it is probable that in a short time these veritable giants of the forest will become extinct, unless protected by law. Fortunately both the State and national governments control some of the groves, although not the grandest.

For the purpose of procuring a specimen of this remarkable tree for the American Museum of Natural History, S. D. Dill was sent to California in the summer of 1891. Through the courtesy and liberality of A. D. Moore, owner of one of the largest groves of Big Trees, and his son (manager of the King's River Lumber Company), Mr. Dill was permitted to select the tree he might desire. After diligent search, he found a fine specimen growing at an altitude of 7000 or 8000 feet and bearing the name "Mark Twain." Nearly all the large trees have been christened by hunters or tourists, and several are marked with marble tablets. Such names as "Bay State," "Sir Joseph Hooker," "Pride of the Forest" and "Grizzly Giant" are familiar.

"Mark Twain" was a tree of magnificent proportions, one of the most perfect trees in the grove, symmetrical, fully 300 feet tall, and entirely free of limbs for nearly 200 feet. Eight feet from the ground the trunk was 62 feet in circumference, while at the ground it measured 90 feet. Mr. Moore kindly took the contract of felling the tree and shipping to the Museum a section suitable for exhibition. The accompanying instantaneous photograph gives a vivid picture of the fall of this noble giant.

The section on exhibition was cut from the trunk about 12 feet from the base, and is 4 feet in thickness. Its estimated weight was 30 tons, and for easier transportation it was split into ten pieces. The face of the specimen as it now stands is 16 feet



MAP SHOWING DISTRIBUTION OF THE "BIG TREE"

An enlargement of the cross-lined area of the accompanying map of California. The relative sizes of the groves are indicated by the number of trees on the map.

THE SEQUOIA

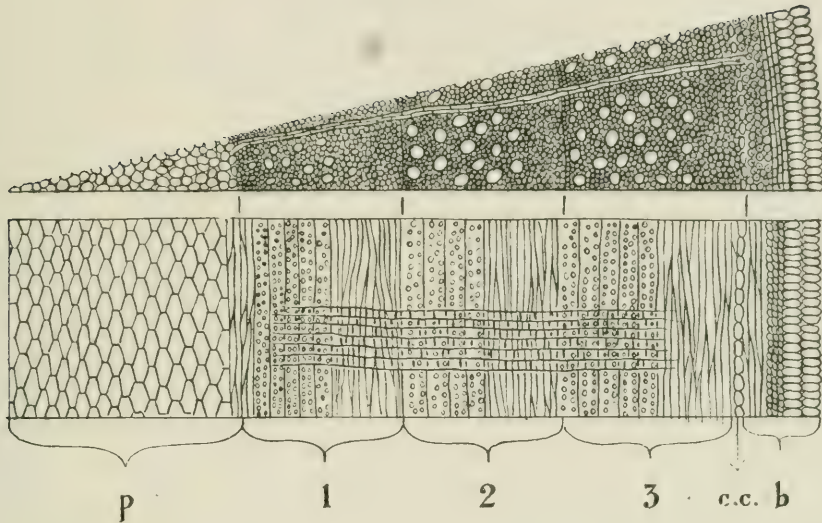


DIAGRAM OF THE STRUCTURE OF THE STEM OF AN EXOGENOUS TREE OF THREE YEARS' GROWTH

Modified from a cut in "Encyclopedia Britannica"

p, pith; cc, Cambium cells; b, bark; 1, 2, 3, growth of wood during first, second and third year.

2 inches in diameter, measured inside the bark, which in places is nearly a foot in thickness.

The Big Tree, like most trees of temperate climates, is exogenous, as is indicated by the concentric circles of wood beautifully shown in this specimen.

A transverse section of the stem of any exogenous tree of one year's growth consists of three distinct areas or zones. In the center is the pith, around this a ring of wood, and surrounding the whole the bark. Each of these layers consists of cells which are variously modified to carry on their respective functions. Uniting the bark and the wood are delicate thin-walled cells, filled with protoplasm and nutrient matter, which constitute the *zone of growth* of the tree. The innermost cells of this *Cambium layer*, as it is called, form the new wood, while the outermost renew the bark. The oldest wood, then, is that nearest the pith, while the oldest bark forms the exterior of the trunk. During the spring, when the sap is running, the multiplication of Cambium cells is very rapid, and consequently more wood and bark are laid down

THE SEQUOIA

than during the fall and winter, when the tree receives little nutrition. These periods of interrupted growth are represented in trees of several seasons' growth by distinct lines separating the rings of wood. In the trees of cold-temperate climates, where the contrast of seasons is great, the rings of wood are very distinct, as, for instance, in the Big Tree. In many trees the increase in the wood forces the bark asunder, which, through the action of the weather, becomes rough and rugged. If it were not for the constant renewal of the inner layers by the Cambium cells, the bark might entirely disappear.

In the case of the wood it is quite different. The inner rings, which are the older, are entirely surrounded by the outer rings of fresh young sap-wood, by which they are protected from climatic changes. Every new circle of wood moves the zone of growth farther from the center. The central wood undergoes a change, its cell walls becoming thicker and the calibre of the ducts or vessels smaller. It usually takes on a different color from the sap-wood. This is now called heart-wood, although it performs no vital function in the life of the tree and is practically dead.

In some of the Big Trees much of the heart-wood has decayed and disintegrated, with no more injurious effect upon the tree than a weakening of the trunk. So much of the heart-wood had decayed in one specimen, which was blown down by the wind, that men on horseback were able to ride into the trunk a distance of seventy feet, and pass out through a hole in the side.

Injuries to the wood are sometimes repaired by the deposit of new layers of cells. It is even possible to determine the year when such injuries occur by merely counting the rings of repair. On the extreme right of the specimen in the Museum are two such wounds. In each of the two places marked with a cross a bullet was found, but the wounds had been covered by at least five years' growth of wood. That the bullets did permanent injury to the wood in the immediate vicinity is indicated by the change of sap-wood into heart-wood, which in these places extends nearly to the edge of the bark.

Since, therefore, the rings of wood correspond to periods of vegetable growth, which are seasonal, and the lines of separation



THE SECTION OF THE "BIG TREE" IN THE MUSEUM

The uppermost series of cards represents events in General History ;
 The light cards immediately below represent changes of thought in the Philosophy of
 Biology ;
 The small black cards mark the succession of centuries in the life of the tree ;
 Of the cards below the black,
 The first row indicates the advance of General Biology ;
 The second, that of Comparative Anatomy ;
 The third (one card) the discoveries of Palæontology ;
 The fourth, the Progress of Embryology.

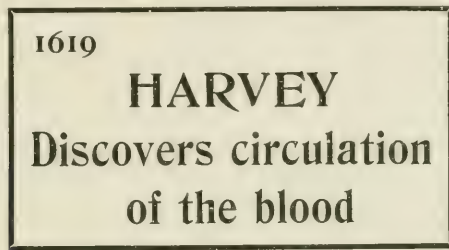


THE SEQUOIA

represent periods of interrupted growth, a tree carries its biography within itself. During more favorable seasons, the circles are wider, and the intensity of the winter intensifies the outlines of the rings.

"Mark Twain" upholds the reputation of the Big Tree for longevity. The rings show that it was 1341 years old when cut down in the fall of 1891. Thus it must have begun its life in A. D. 550, or only seventy-four years after the Fall of Rome. Practically all of medieval history, as well as modern, must be included in this period, while Natural Science or Biology may be said to have developed during its old age.

The small black cards which have been placed on the tree mark the successive centuries and give the growth of the tree during each hundred years. The uppermost row of white cards



indicates political events and discoveries which have had influence on the progress of civilization since the year 550. The remainder show the progress in biology. The group immediately above the black cards represents the change in thought in philosophical biology, while those below give a history of biology proper.*

When the tree was a mere sapling, Europe was overrun by the Goths, Vandals and Franks, and a state of almost universal war prevailed. About twenty years later Mahomet was born,

* Each card is mounted on a pin which is stuck into the ring of growth corresponding to the date on the card. For example, in the accompanying sketch: 1619 is the year that William Harvey announced his discovery of the circulation of the blood. The pin attached to the card is inserted into the ring of wood which represents the growth of the tree during the year 1619. In some instances it has been necessary to put two dates on a card. In these cases the pin has been stuck into the ring of growth of the earlier date.

THE SEQUOIA

and then followed the establishment of the Mohammedan religion, which, during the next one hundred and fifty years, reached the zenith of its power and threatened to overrun the whole world. This Saracenic invasion was checked at the battle of Tours (732), in which the Franks under Charles Martel overwhelmingly defeated the Mohammedans. The beginning of the next century was marked with the crowning of Charlemagne on Christmas day, 800. This monarch made a noble effort to educate his people by establishing a school at his court and inviting thither the few learned men of his time.

The climatic conditions in California during A.D. 800 and the year preceding must have been very favorable for the growth of our tree, which had already attained the size of a large elm. Its growth during these two years, indicated by the large rings, was phenomenal.

During this century occurred also the effort of King Alfred to establish schools in England. The hardy Norsemen began their bold voyages in quest of treasure and adventure, colonized Iceland in 874, discovered Greenland (981), and pushing farther westward probably sailed down along the eastern shore of America.

The Crusades, begun in 1096 and continuing for almost 200 years, brought the various European peoples into intercourse, which resulted in exchange of ideas and helped prepare the popular mind for the discoveries which were soon to follow.

The first half of the thirteenth century saw the founding of the universities. First, the University of Paris (1200), which became the center of theology; a few years later were founded the University of Bologna, famous for law, and the University of Padua, which attracted the greatest students in medicine. In England, Oxford University was founded in 1249.

The fifteenth century brought those marvelous discoveries which were of so much importance in the advancement of civilization, and which contributed to the growth of science. Printing with wooden block type was introduced by John Gutenberg in 1438, and his invention was followed in 1450 with the use of metal type, making the general dissemination of knowledge possible.

THE SEQUOIA

Columbus' discovery of America (1492) was followed by Magellan's famous trip around the world to the westward (1519-1522), during which he discovered the Philippines; and about the same time Cortez conquered Mexico. The New World was soon explored for its reputed hidden treasures, and astronomers' search of the heavens for an orderly movement of planetary bodies resulted in the elaboration of the system of Copernicus (1543). Kepler announced his laws of planetary motion at about the same time (1609), and in the latter part of the seventeenth century Newton enunciated the law of gravitation. The increasing freedom of thought was expressed in the American and French Revolutions.

The rapid course of invention during the nineteenth century is too familiar to require detailed mention. The period of the tree's growth, however, is represented by only a few inches in its total diameter.

The cards representing the growth of biology are arranged in two groups. Those above the line of black cards represent the change of thought in the *philosophy* of biology, while those below the line indicate some of the great discoveries which have made the science what it is to-day. The latter have been divided into three rows, the uppermost representing General Zoölogy, the middle Comparative Anatomy and Palæontology, and the lowest series the evolution of Embryology.

Very strikingly is it shown that not only the scientific side of all branches of biology, but also the philosophical or speculative side, has been developed during the old age of the tree, or during the last 300 years. In fact, modern zoölogy and inductive methods may be said to have begun with William Harvey in the seventeenth century.

It is true that when the tree began its life, men had ideas and conceptions of the principles underlying nature, but most of these were crude and inaccurate, based on mere hearsay or tradition, and differing but little from those held before the beginning of the Christian era.

The science of anatomy had been at a standstill since the time of Galen (A.D. 130). This brilliant anatomist, it is true,

THE SEQUOIA

advanced the study of anatomy by his careful dissections of apes and some of the lower animals, and he also wrote extensively on physiology; but accurate as some of his observations were, his errors, particularly in physiology, were many. His works, however, remained authoritative for fully 1400 years; his statements overruled the demonstrations of nature, and he was so revered that whoever had the courage to dispute him was liable to persecution and ostracism.

Physiology was not materially different from metaphysics, and both were affected with superstition. The ancient belief that the body contained *four humors*—"blood," "phlegm," "yellow bile," "black bile"—was held, and Galen had added to these a "pneuma," which pervaded the whole body, mingling with the humors and supporting life. The proper mixture of four elements—heat, cold, wetness and dryness—constituted the normal individual. The administration of drugs was in accordance with this belief. Systematic zoölogy did not exist. There was no true conception of species, no accurate description of animals, and no adequate system of classification. The naturalists were merely compilers and copyists of Aristotle and other ancient writers.

The philosophical or speculative in biology was retained by the clergy, almost the only persons really interested in the conservation of documents, and as a class the only ones able to read and write.

Some of the Greeks had had explanations of the succession of organisms on the globe. Aristotle believed that the first animals arose from the ocean, and that low forms of life were constantly springing into existence by spontaneous generation, a fallacy which was not completely rooted out of biology until the nineteenth century. Aristotle also perceived the principle of adaptation in nature, and considered the universe as the result of Intelligent Design. These ideas of the Greeks had a marked influence on Christian thought for many centuries. Augustine (fifth century) believed that a living substance had been made by the Creator, and that from this had developed all the diverse organisms of the present time. Two other famous churchmen advocated similar views, Erigena in the ninth century, and



FELLING THE TREE

THE SEQUOIA

Thomas Aquinas in the thirteenth, each the foremost scholar of his day. But naturally a wider and deeper knowledge of biological phenomena was necessary before philosophical biology could have a strong foundation. Hence the philosophy of zoölogy dates from the awakening of science in the seventeenth century.

From the time that the Big Tree was a mere seedling up to the time that it measured fully 13 feet in diameter, there was scarcely a single discovery in the field of natural science worthy of record. One event, however, which occurred when the tree measured only 12 inches in circumference is of some interest. Silk was one of the treasures obtained from the Far East. Its production was carried on solely by the Chinese, who jealously guarded the silkworms and their eggs. The story is that two monks travelling in China succeeded in smuggling some eggs out of the country by concealing them in a hollow cane, and brought them into Europe. In the warm climate of the south the eggs developed into strong healthy worms. From such a humble beginning arose the extensive silk industry of southern Europe.

The stagnation of the study of anatomy for more than a thousand years was due to an extravagant admiration of Galen, over-confidence in his writings, and the failure of men to make observations for themselves, or to believe what they saw with their own eyes. Vesalius (born in 1514) was the first anatomist to assert independence, and to him is due the credit of laying the foundations of modern anatomy. Vesalius dissected the human body and accurately described what he found. He established a school of anatomy at Padua, and among his students was Fabricius, the teacher of Harvey, who startled the world in 1619 with his discovery of the circulation of the blood. This discovery, which revolutionized the study of physiology, and gave new impetus to the study of anatomy, met with bitter opposition from the followers of Galen, but Harvey successfully defended himself.

The opposition to Harvey set men to thinking, and investigation began. All forms of life were studied with all available means. Harvey, from an investigation on the development of

THE SEQUOIA

the chick, laid the foundations of the study of embryology, one of the four great supports of the theory of evolution; and propounded the theory of *Epigenesis*, a theory vigorously argued by philosophers for many years. The compound microscope, already mentioned, was applied to the study of organisms by Leeuwenhoek and Malpighi. The former demonstrated capillary circulation (1690) and discovered red blood corpuscles, infusoria and spermatozoa (1677). These spermatozoa were regarded by some as parasites of animal bodies, by others as embryos which only needed nourishment to develop into an adult form. Malpighi applied the microscope to the study of the chick, and his observations led him to announce the theory of *Preformation*, which was opposed to the epigenesis of Harvey.

The preformationists contended that a given species contained within its sperm or ovum all the descendants of that species, with all organs and parts fully formed. In other words, embryos were only miniature adults, and were contained one within another like a series of Chinese boxes, in successive grades of size. The doctrine of epigenesis was that each sperm or ovum contained a *homogeneous* living substance which became differentiated by gradual changes into an individual resembling the parent. Preformation was supported by Spallanzani, Bonnet, Haller and even Cuvier. Its absurdity was shown by the work of Wolfe (1759), who firmly established the doctrine of epigenesis as it is believed to-day, although more frequently known as *embryological development*.

The stimulus given to research by Harvey's discovery, the intercourse and exchange of views among men, and the voyages to all parts of the world resulted in an accumulation of a great mass of facts, which were of little value unless classified. Conrad Gesner (in 1551-1558) had given a complete bibliography of zoölogy, and was the most important of the earlier naturalists. About a hundred years later Ray, an English zoölogist (1670), made an attempt to establish a "system of classification," but he had no true conception of species. It remained for Linnæus to complete a system which served its purpose so well that it has remained practically unchanged to the present time.

THE SEQUOIA

Linnæus recognized that certain groups of animals were subordinate to other groups, and by his *binomial nomenclature* he provided a place in his system for every species. To each species two Latin names were given; the first, always beginning with a capital, was the name of the genus; the second, now usually spelled with a small letter, that of the species. For example, the scientific name of our Big Tree is "*Sequoia gigantea*," that is, *Sequoia* is the name of the genus, and *gigantea* the name of the species. (To avoid confusion, it is customary now to add the name of the scientist who first describes the species; thus, "*Sequoia gigantea* Decaisne," indicates that Decaisne was the naturalist who first described and named the Big Tree.)

The first edition of Linnæus' "Systema Naturæ" was published in 1735. Linnæus was a firm believer in the special creation of each species, and in one of his books says, "We reckon as many species as issued in pairs from the hands of the Creator."

Among the naturalists of the eighteenth century, Goethe and Cuvier are conspicuous. The former (1796), although a great poet, made valuable contributions to science. He introduced the word "morphology" as a designation of the study of form or structure, and was the first to advance the *vertebral theory* of the skull, that is, that the skull represents modified vertebræ. He recognized the significance of vestigial organs, for example, gill slits in human embryos, appendages in whales, etc., and predicted the discovery of the premaxilla in man—the supposed absence of which was considered to be a character which distinguished man from the apes.

It was, however, Georges Cuvier (born in 1769), the famous French naturalist, who was the leader in science for more than half a century. He stands as a striking example of a man who was remarkably correct in his observations of nature, but equally incorrect in his generalizations. His work on the Tertiary mammals of France marked the beginning of palæontology. He was the first to point out the resemblance between "*Archæotherium*" and the modern horse, a fact which is one of the strongest evidences of evolution. He was a preformationist and believed in *Catastrophism* (the theory that the earth as it is at present is the

THE SEQUOIA

result of successive catastrophes), rather than *Uniformitarianism* (the belief that the present condition of the earth has been brought about by a gradual, uniform change). The work of Cuvier in comparative anatomy is also important, and he is called the founder of this science. He recognized the principle of correlated growth, and in "Le Règne Animal" improved the classification of animals.

The last century of our tree's life was remarkable for the discoveries in all branches of natural science. De Blainville (1839-1849) and Lyell (1797-1875) made valuable contributions to palæontology and geology. Lyell's "Principles of Geology" (1830-1833) dealt a death blow to catastrophism, and is a work second only in importance to the "Origin of Species."

Milne-Edwards (1800-1818) enunciated the principle of the physiological division of labor.

Von Baer (1828) announced the law that bears his name, namely, "individual development is a recapitulation of race development."

Schleiden and Schwann (1838-1839) discovered cells in plants and animals, and propounded the cell theory.

Valentin (1839) named the "nucleus," and was the first to speak of the "cell theory."

Purkinje and von Mohl (1840) named the substance of the cell *protoplasm*.

Serres (1842) asserted that all missing links would be found in embryology.

De Barry (1843) observed the union of sperm and ovum.

Kölliker (1846) demonstrated that sperm are developed from the tissues of the testes.

Owen (1846) pointed out the difference between *homologous organs*, for example, the arm of man, fore limb of horse, and wing of bird, organs which are formed on the same structural plan, and *analogous organs*, for example, wing of bird and wing of butterfly, organs differing entirely in structure, but performing the same function.

Remak (1850) described "three germinal layers," and Huxley (1859) homologizes them in the lower animals.



THE SECTION BEFORE SHIPMENT

THE SEQUOIA

Rapid strides were made also in systematic zoölogy and in zoö-geography. The relations of the lower animals were worked out by Leuchart, Vaughn Thompson, Dujardin, Agassiz and a host of others.

Expeditions were sent out to explore the earth and the sea. Famous among these are the voyage of the "Beagle," on which Darwin served and did some of his earliest biological work; and the voyage of the "Rattlesnake," on which Huxley was Assistant Surgeon.

In 1859 Darwin published his "Origin of Species," a book which is universally admitted to have had more influence on human thought than any other work of the century.

Darwin's theory of the "Origin of Species" may be stated briefly as follows: All species tend to vary. No two individuals of the offspring of a pair are exactly alike. On account of this variation in structure or function, certain individuals are better able to thrive than their fellows. These animals transmit these characters to their offspring, which in turn survive in the struggle with their fellows. Thus nature eliminates those variations which are disadvantageous to the organism, each individual being tested in its struggle to maintain its existence. The accumulation of these favorable variations through many generations is supposed to produce an organism quite different from the original stock, or, in other words, a new form.

Few works have been constructed with more care and skill. For twenty years Darwin collected facts from all available sources, and made innumerable observations himself. The evidence in support of his theory was drawn from all branches of natural science: comparative anatomy, embryology, palæontology and zoö-geography. So numerous were the facts that he presented, and so careful was the exposition of his theory, that in less than twenty years it became the working hypothesis of nearly every biologist.

Long before Darwin's time the resemblance between groups of animals had been recognized, and many new facts made known by investigators from Vesalius onward emphasized these resemblances. In 1620 Bacon published "Novum Organum," in which

THE SEQUOIA

he advocated the unity of nature. Descartes (born, 1596) attempted to explain the universe on natural laws. Leibnitz (born, 1646) advanced a theory of the continuity of organisms. The term "*evolution*" was introduced by Bonnet as a name of the process by which organisms had become differentiated. He expressed this relationship by introducing the idea of a "scale of beings," which formed the links of a chain. This conception has persisted up to the present time, in the expression "the missing link."

It was Lamarck (1809), the contemporary and fellow-countryman of Cuvier, who was the first to express the blood-relationship of organisms, as is done to-day, namely, by means of the *genealogical tree*. This eminent anatomist and investigator held views much in advance of his time. He rejected entirely the fixity of species, and believed that all animals now existing had been derived from a common stock by a process of gradual change. In one place he affirms that "Nature needs only matter, time and space to produce all changes." The two factors which he believed most important in producing these modifications were the reaction of the organisms to their environment and the inheritance of the modifications resulting from this reaction and of the effects of use and disuse of organs.

Lamarck's theory was partially smothered in the ridicule which Cuvier heaped upon it. Cuvier was a firm believer in the immutability of species and his great authority in biological subjects made him a powerful dictator of public opinion.

From Lamarck to Darwin there were few philosophers of note. Erasmus Darwin (1794) and Oken (1805) embodied in their writings the idea of the continuity of life.

In 1844 a book called "*Vestiges of Creation*" appeared and caused quite a sensation. That this was published anonymously is significant of the attitude of the public toward the idea of evolution.

Naturally the "*Origin*" met with a storm of opposition, but it was vigorously defended by Huxley. He it was who perhaps more than any other scientist secured for the "*Origin of Species*" a fair and impartial treatment and thus aided the cause of truth.



THE STUMP OF "MARK TWAIN"
Ninety feet in circumference

THE SEQUOIA

Among the earlier champions of Darwin's theory, were Lyell, Tyndall, Hooker and Spencer.

More recently the philosophy of zoölogy has centered around the question of the inheritance of characters acquired during the life of the organism, and biologists at present are divided into two schools; one, nominally led by Herbert Spencer, contend that such characters are inherited; the other, of which August Weismann is the head, deny the inheritance of acquired characters and affirm that "natural selection," acting on congenital variations, is sufficient to produce the diverse organic forms.

Since Darwin's time the growth of biology has been phenomenal. This is due to the enthusiasm of the great number of investigators in every branch of science, and to the application of modern inventions in methods of research. Governments, as well as private individuals, have contributed generously to aid the work. Expeditions for exploring the depths of the sea and the remotest parts of the world have been organized and successfully carried out.

A. R. Wallace in 1876 published his "Distribution of Animals," which was the first complete treatise on zoö-geography, one of the pillars of evolution.

The "Challenger" expedition (1872-1876), sent out by England, obtained more than 8000 species new to science.

The United States Fish Commission, established by the Government, through the energy of Professor S. F. Baird, as well as the National Museum and the Geological Survey, have made valuable contributions to science.

Among the seashore laboratories, that founded at Naples in 1870, by Professor Dohrn, is most famous.

Palæontology too has had a rapid growth. Cope in this country discovered and described more than a thousand new species of vertebrates, many of which are on exhibition in the Hall of Fossil Vertebrates. In invertebrate palæontology James Hall was one of the leaders, and a large proportion of the material upon which he did his monumental work is displayed in the Geological Hall.

The researches of Louis Pasteur have revolutionized both the

THE SEQUOIA

theory and practice of medicine, and bacteriological discoveries of the past decade have probably done more to alleviate human suffering than all the efforts of any previous century.

In short, every sphere of human activity, social, religious, industrial and intellectual, has felt the influence of and has been profoundly modified by those marvelous discoveries of science which have occurred even since this Sequoia attained gigantic proportions.

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THE Thirteenth International Congress of Americanists was held in the halls of the Museum from October 20 to 25, in accordance with the invitation of President Morris K. Jesup. The officers of the Congress, who were elected at the first session, were as follows:

THE BUREAU OF THE CONGRESS

President, MORRIS K. JESUP,

President American Museum of Natural History.

Honorary President, THE DUKE OF LOUBAT,

Correspondent of the Institute of France (Academy of Inscriptions and Belles Lettres).

Vice-Presidents:

For the Argentine Republic, JUAN B. AMBROSETTI, National Museum; for Mexico, ALFREDO CHAVERO; for France, LÉON LEJEAL, College of France; for Germany, KARL VON DEN STEINEN, University of Berlin; for Sweden, HJALMAR STOLPE, Royal Ethnographical Museum; for the United States, F. W. PUTNAM, American Museum of Natural History.

General Secretary, M. H. SAVILLE, American Museum of Natural History.

Treasurer, HARLAN I. SMITH, American Museum of Natural History.

Council: LEOPOLDO BATRES, Mexican Government; FRANCISCO BELMAR, State of Oaxaca, Mexico; JOHN H. BILES, University of Glasgow, Scotland; WILLIAM P. BLAKE, Territory of Arizona; FRANZ BOAS, Columbia University; E. G. BOURNE, Yale University; CHARLES P. BOWDITCH, American Anti-

THE AMERICAN MUSEUM JOURNAL

quarian Society; DAVID BOYLE, Canadian Government; H. C. BUMPUS, American Museum of Natural History; SYDNEY H. CARNEY, Jr., New York Historical Society; A. F. CHAMBERLAIN, Clark University; ALONZO M. CRIADO, Government of Paraguay; STEWART CULIN, University of Pennsylvania, American Philosophical Society, Numismatic and Antiquarian Society of Philadelphia; GEORGE A. DORSEY, Field Columbian Museum; G. T. EMMONS, U. S. Navy; HENRI PITTIER DE FABREGA, Instituto Physico-Geografico of Costa Rica; LIVINGSTON FARRAND, New York Academy of Sciences; ALONZO FERNANDEZ, State of Mexico, Mexico; JUAN F. FERRAZ, Costa Rica; ALICE C. FLETCHER, Peabody Museum, Harvard University; D. C. GILMAN, Johns Hopkins University and Carnegie Institution; STANSBURY HAGAR, Brooklyn Institute of Arts and Sciences; C. V. HARTMAN, Swedish Anthropological Society; LUIS A. HERRERA, Government of Uruguay; F. W. HODGE, Smithsonian Institution; W. J. HOLLAND, Carnegie Museum; W. H. HOLMES, U. S. National Museum; A. L. KROEBER, University of California; NICOLAS LÉON, Mexican Government; A. P. MAUDSLAY, Anthropological Institute of Great Britain and Ireland; MRS. VIRGINIA McCLURG, Colorado Cliff Dwellings Association; G. G. MACCURDY, Anthropological Society of Paris; W. J. MCGEE, National Geographic Society; J. D. MCGUIRE, American Anthropological Association; EDWARD S. MORSE, National Academy of Sciences; ZELIA NUTTALL, University of California; A. S. PACKARD, Brown University; L. C. VAN PANHUY, Netherlands Government; N. BOLET PERAZA, Government of Honduras; MRS. C. E. PUTNAM, Davenport Academy of Science; EDUARD SELER, German Government; FREDERICK STARR, University of Chicago; J. J. STEVENSON, New York University; MAX UHLE, University of California; JAS. GRANT WILSON, American Ethnological Society.

The question of the early remains of man on this continent naturally received much attention at this Congress and papers on subjects pertaining thereto were read by several of the dele-

THE AMERICAN MUSEUM JOURNAL

gates. In addition to the ancient human remains which have been found in California, Iowa, Nebraska, Mississippi and Illinois, discoveries have been made during the last fifteen years in a so-called interglacial gravel deposit along the Delaware River near Trenton, New Jersey, which have indicated a very high antiquity for man in America. Prof. F. W. Putnam laid before the Congress the results obtained by the careful and extensive investigations of Ernst Volk in the Trenton gravel during the last ten years, illustrating his remarks with the articles obtained, which are now in the American Museum. The most important discoveries consist of the remains of several skeletons which were unearthed in the summer of 1899. They lay beneath two feet of black clay and five feet of yellow and greenish-yellow sand, belonging to the glacial deposits, and containing all the indications of glacial action. The black bed is considered to belong to the time during which the ice-front made its first retreat. The bed of sand shows thin, easily-recognized streaks which vary in color from white to greenish-yellow, clear yellow and dark yellow. Inasmuch as these bands nowhere show any succeeding disturbance, it follows without question that the skeleton reached the place in which it was discovered before the laying down of the sand bed. Furthermore, south of Trenton, there has been exhumed from a sand bed a left human femur in the vicinity of which there was also discovered an elk bone and fragments of bones of the musk-ox. In addition to these there were found several pieces of stone which showed indubitable evidence of human workmanship, so that now it can no longer be doubted that the fact has been established that America was inhabited by men during Glacial time. How many thousand years ago this period may have been is a question which cannot yet be answered with certainty, but it may well have been between 10,000 and 20,000 years.

In March of the present year there were discovered in the vicinity of Lansing, Kansas, a human skull and some other bones which lay from 19 to 20 feet below the surface of the ground and 69 feet from the mouth of the tunnel the digging of which led to their

THE AMERICAN MUSEUM JOURNAL

discovery. The material of the bed in which the objects were found is loess. The question of the Lansing skull and its relations was discussed in papers by Professors T. C. Chamberlin, W. H. Holmes and S. W. Williston and Drs. George A. Dorsey and Aleš Hrdlička. In type and measurements the skull has proved to be scarcely different from the average of those of the present American Indian. The locality where the find was made has been studied by several geologists, and Professor T. C. Chamberlin states that in his opinion at least 8000 years must have elapsed since the deposition of the beds in which the skull was found. In reference to the similarity between the Lansing skull and the skulls of the present Indians, Professor Putnam remarked that it only served as a further argument for the high antiquity of the Indian race in America. Prof. Franz Boas has arrived at similar conclusions regarding the long human occupation of this continent on account of the great complexity of the American people in reference to their languages and characteristics.

Professor Boas detailed to the members of the Congress the results which have been obtained for the Museum through the labors of the men engaged on the Jesup North Pacific expedition, information regarding which has been given at length in previous numbers of the JOURNAL.

Several of the important papers submitted to the Congress pertained to the archæology of Mexico. Among these may be mentioned particularly those of Alfredo Chavero, Leopoldo Batres, Nicolas Léon, M. H. Saville, Edward H. Thompson and Mrs. Zelia Nuttall.

M. H. Saville read a paper upon the new discoveries near Mitla, which he made in the course of investigations provided for through the liberality of the Duke of Loubat. Among other things Mr. Saville made clear that the temples at Mitla, like all other sacred buildings of ancient Mexico, have been erected upon terrace-like substructures which, however, here have been destroyed to a great extent by the action of wind and weather. He also made mention of a new cruciform subterranean chamber which he discovered under one of the largest temples in Mitla in

THE AMERICAN MUSEUM JOURNAL

a state of perfect preservation. This chamber has an extreme length of about 45 ft. and is the most important structure of its class thus far found in Mexico.

Mr. Batres gave a description of the discoveries made in the year 1900 behind the cathedral in the City of Mexico while excavations were in progress for the new drainage system of the city. The speaker stated that during these excavations more than 8000 different objects had been brought to light, among which were numerous idols, elaborately painted urns, stone knives and various votive offerings, and that the number of articles of jewelry made of gold, turquoise, jade, onyx and other valuable stones was very large. Many of the objects show in their workmanship a high degree of perfection. The scientific investigation of this material is sure to throw much new light upon the culture of the Aztecs. In this connection also the papers of Prof. Eduard Seler on the religious compositions and picture-writings of the ancient Mexicans were of great value.

Mrs. Zelia Nuttall read a paper upon the self-inflicted tortures of the religious devotees of the ancient Mexicans in which she stated that on certain days the tongue, ears or other parts of the body of the devotee were pierced with pointed sticks or the sharp thorns of the agave. The blood flowing from the wound was caught in sacrificial vessels which were then placed at the feet of the representations of the gods.

Edward Thompson displayed a complete series of reproductions in color of the wall paintings which he had discovered on the peninsula of Yucatan in the temples of Chacmultun and gave a clear idea of the heretofore practically unknown color-materials of the Mayas. The conclusion to which Mr. Thompson has arrived is that these people used nothing but vegetable colors in the decoration of their walls, among which one can distinguish two shades of blue, two different greens, besides red, brownish-red, yellow, black and white. The colors were put on with an oily fat, and by means of a fine brush of hair, upon the cream-colored stucco which formed the surface of the walls. In their character the paintings remind one of the naïve pictures with

THE AMERICAN MUSEUM JOURNAL

which the monks of the middle ages in Europe decorated their manuscripts and church walls. Mr. Thompson also displayed to the Americanists by means of kinetoscopic pictures a Yucatan sun-dance, and at the same time gave phonographic records of the songs which were sung during each of the dances.

A. P. Maudslay displayed forty magnificent enlargements of photographs of Maya ruins and sculptures and a copy of his monumental work upon these antiquities, a work which marks an epoch in the history of the investigation of the culture of these people. Miss Adela Breton exhibited her copies of the well-known mural paintings of Chichen Itza.

The discoveries which have been made by the explorations of the Hyde Expedition under George H. Pepper of the Museum were detailed to the Congress in an important communication regarding the excavations made at Pueblo Bonito. Pueblo Bonito is, perhaps, the most important ruined city of New Mexico, and consists of an enormous building in the shape of a half-ellipse with a circumference of 1300 feet, and contains more than 640 rooms, in which between three and four thousand persons could find accommodation. Among the thousands of objects which have been found there those are of especial interest which have been discovered in the so-called Kiwa, the sacred treasure-house of the different religious orders of the Pueblo. Among these are countless remarkable ceremonial staffs and sacred utensils, beautiful amulets and pendants from costly turquoise, and bituminous coal, and a few painted terra-cotta jars, which from their form seemed to be better adapted for drinking vessels than for the carrying out of religious ritual.

The present-day Indians were discussed in various relations. Miss Alice Fletcher and Dr. George A. Dorsey read papers on the ritualistic ceremonies of the Pawnee, from which it appeared that the belief in the Great Spirit which is to be found in many Indian tribes (the Wakan-tanka of the Sioux, the Manitou of the Ojibwa) is more highly developed among the Pawnee perhaps than in any other Indian tribe in America. Tarawah, the Great Spirit of the Pawnee, is not merely the master of life but also the

THE AMERICAN MUSEUM JOURNAL

source of all things, the ruler of the stars and of the universe in general. During their religious ceremonies an especial place is kept for him in the tent beside the fire, which is too holy for any one to dare to step upon, but which one honors through gentle touching with the finger tips.

It is entirely impossible to give in our contracted space an adequate idea of the full programme of the Americanists' Congress, and the scientific discussions of the Indian picture-writing, migrations, languages, customs, traditions, musical and artistic accomplishments etc. It may suffice to state that, in spite of the five days which the Congress lasted, only about two-thirds of the 105 papers which were presented could be read in full or even in abstract, the remainder being read only by title. On account of the multifarious duties of the Secretary of the Congress and the early date at which it was necessary to put the foregoing report into shape, it has been made up from newspaper accounts and other sources and does not lay claim to any degree of fulness. About 150 members were present at the various sessions of the Congress and the international character of the convention may be judged from the fact that delegates from twenty different nations were present. During the week following the sessions of the Congress the foreign members in attendance were the guests of the Pennsylvania Railroad Co. on an excursion which included visits to Philadelphia, Washington, Pittsburg, "Fort Ancient" (in southern Ohio) and Chicago. Everywhere the Americanists were received with the greatest hospitality, and in Washington were given a reception by President Roosevelt.

NEWS NOTES.



OUR expeditions were sent out by the Department of Vertebrate Palæontology during the summer season of 1902. The first went into the region north of Miles City, Montana, seeking for the remains of horned Dinosaurs, under the direction chiefly of Barnum Brown, associated with Prof. R. S. Lull of

THE AMERICAN MUSEUM JOURNAL

Amherst College and Mr. Brooks, a recent graduate of Amherst. They were successful in discovering a skull which lacked the upper portions of the horns only, and which has an especially complete frill. Portions of the skeleton also of the same animal and of other horned Dinosaurs and the remains of a carnivorous Dinosaur of gigantic size were found; and just before the expedition closed three Crocodile skeletons and portions of the skeletons of several beaked Lizards (rhynchocephalians) were discovered.

The second expedition in Montana, under the leadership of Dr. W. D. Matthew, was in quest of mammals, chiefly of the Miocene period. Two important discoveries were made. First, of the beds containing the remains of some of the smaller animals of the period when the Titanotheres flourished, especially small carnivores and rodents and some primitive species of Horse, among them *Mesohippus westoni*. The small fauna of the lower Oligocene had already been made known partly through the researches of Earl Douglas, but our collection greatly adds to his interesting results. The second discovery of this party consisted of the lower jaws and extensive portions of the limbs and skeleton of a large Rhinoceros, probably belonging to the species *R. malacorhinus* Cope, a long-limbed animal which has been known hitherto from its skull and a single foot bone only. We are now enabled to give almost the complete characters of this long-limbed and long-skulled type, which stands in marked contrast to the more abundant short-limbed and short-skulled Rhinoceros of the same period, named *Teleoceras*.

The third expedition, under the leadership of Walter Granger associated with Peter Kaison, returned to the vicinity of the famous Bone Cabin dinosaur quarry of central Wyoming for the fourth year of excavation. The early part of the season was devoted to a new dinosaur quarry discovered by W. H. Reed, and systematically explored by the Museum for the first time in 1901. This quarry proved to be very rich, especially in remains of the giant herbivorous Dinosaur named *Camarasaurus*. After work was finished at this point, the Bone Cabin quarry was systematically

THE AMERICAN MUSEUM JOURNAL

explored, and yielded a rich harvest of fifty-two boxes, mostly fine specimens, several of which are new to our collection.

The search for fossil Horses was continued under the direction of J. W. Gidley, especially in the southern portion of South Dakota. The results were only fairly satisfactory, and the first six weeks of exploration in the Niobrara beds was disappointing. Just as the work was drawing to a close, however, a brilliant discovery was made of the remains of a small herd of fossil three-toed horses belonging apparently to the genus *Hipparion*, and parts of numerous fore and hind limbs in a perfect state of preservation, and one skull and an associated skeleton so complete that it may be mounted were found. This discovery more than repaid the party for all the hard and disappointing work of the early part of the summer, and added another much desired stage to the collection presented to the Museum through the generosity of William C. Whitney, Esq.

After months of most difficult and skilful work, chiefly under the direction of Adam Hermann, three specimens of rare interest have been made ready for exhibition. The first is the complete skeleton of a small new Dinosaur which is to be named "The Bird Catcher," owing to its apparent capacity for great speed and the long and slender, grasping structure of the hands.

The second specimen is the great Fish *Portheus molossus* secured by Charles H. Sternberg in Kansas in 1900. This magnificent specimen, sixteen feet in length, has been mounted on a large panel, and we may fairly claim that it is the most striking specimen of a fossil fish in any museum in the world. The missing parts have been restored with the greatest care in light-colored plaster, so that there is no mistaking the restored for the original portions of the specimen.

The third exhibit is the superb pair of tusks and skull of the great *Elephas imperator*, secured from Texas last year. The tusks are thirteen feet, six inches in length, and twenty-two inches in circumference. The entire upper portion of the skull has been restored in white plaster. The specimen has been

THE AMERICAN MUSEUM JOURNAL

mounted with a view to showing the actual height of the skull in an animal of corresponding size.

The Department of Mammalogy and Ornithology has recently received a valuable collection of mammals from the vicinity of Repulse Bay, Arctic America, obtained for the Museum by Captain George Comer, consisting of a fine series of Barren Ground Caribou, Musk-Oxen, and of the smaller mammals of the region, including Wolverenes, Arctic Foxes, Weasels, Arctic Hares and various species of Lemmings. This collection of mammals is of especial value to the Museum, being the first it has received from the main-land of Arctic America bordering Hudson Bay.

Recent news from the Andrew J. Stone Expedition, now collecting in northern British Columbia, for the Department of Mammalogy and Ornithology, indicates that the season's work has been very successful, and that the amount of material will far exceed that obtained last year. Up to the middle of September more than thirty large mammals had been collected, consisting of Bears, Foxes, Wolves, Mountain Sheep, Mountain Goats, Moose and Caribou, and about 800 small mammals. The expedition will remain in the field till the end of November, and the collections will probably reach the Museum about the end of December.

LECTURES.

During December the following lectures will be given at the Museum:

By Prof. A. S. Bickmore to the members of the Museum:

December 4.—“The French Alps.”

December 11.—“Historic Towns of Central France.”

December 18.—“Historic Towns of Southern France and the French Riviera.”

On Christmas Day at 3 P.M. Professor Bickmore will lecture to the general public on “The French Alps.” No tickets are required for admission.

THE AMERICAN MUSEUM JOURNAL

Under the auspices of the Board of Education:

Tuesday evenings at 8 o'clock,

December 2.—Mrs. J. H. HAYNES, "The Bedouins of the Euphrates."

December 9.—S. W. NAYLOR, "Jerusalem and Her Environs."

December 16.—G. C. MARS, "Cairo."

Saturday evenings at 8 o'clock,

December 6.—W. T. ELSING, "Ants and Bees."

December 13.—WM. HARPER DAVIS, "Snakes."

No tickets of admission are required.

MEETINGS OF SCIENTIFIC SOCIETIES.

The programme of the meetings of the New York Academy of Sciences for the month is as follows:

December 1.—Business Meeting and Section of Astronomy, Physics and Chemistry.

December 8.—Section of Biology.

December 15.—Annual Meeting and Presidential Address.

December 22.—Section of Geology and Mineralogy.

The public is invited to attend these meetings, which are held in the assembly room of the Museum.

The Linnæan Society of New York will hold its regular meetings at the Museum on December 9 and 23.







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